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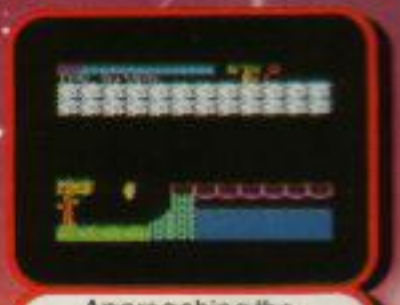

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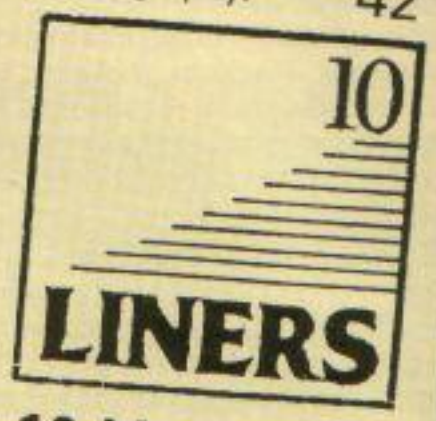

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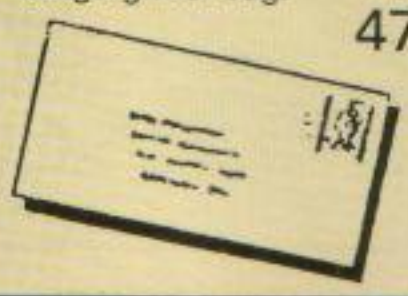

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electron user NEWS

New lines will be revealed at show

EXHIBITORS have begun revealing the new products and bargain offers they will be bringing to the Electron & BBC Micro User Show in London.

The show takes place at the New Horticultural Hall, Westminster, from November 13 to 15.

Slogger is launching a new disc interface for the Electron which has a standard Acorn DFS. This means that Electron owners can now type ahead, without waiting for their disc drive to stop before using the micro.

It costs £75.95 – £199 including disc drive – and will be available at a special discount to show visitors.

Home & Business is offering a special discount of 25 per cent off the regular prices of its monitors.

Link to Ceefax service coming

LOCKED in a bedroom away from his wife, two children and a noisy dog, physicist John Wike has been labouring in the early hours of the morning to perfect a Mode 7 adaptor for the Electron.

Six months of development work, which had to be done after a hard day at the Velindre hospital in Cardiff, has finally paid off.

The adaptor is now on the market and works perfectly – but improvements to the original idea are still underway.

John bought his Electron three years ago with the idea of developing new products for what he considers to be an excellent micro.

"The project was started after friends kept pestering me to make a Mode 7 adaptor for them", he said.

"Even though it's now up and running I won't be completely satisfied until its full potential has been realised".

The add-on currently gives full colour viewdata type text and graphics compatible with Prestel and Micronet services. However, John eventually intends that it should enable Electron users to access the Ceefax and Oracle information services, as can be done on the BBC Micro.

He told *Electron User:* "I am still having to perfect the system at night after work but it will only be a matter of weeks before the upgrade is ready".

FINANCIAL SOFTWARE

A BATCH of new finance and calculation software has been released for the Electron by WL Computer Services on the Room 7 label.

Easy Banker, says WL (051-426 9660), handles up to 20 accounts and 1,000 transactions per 40-track disc and can deal with regular income and expenditure and standing orders on a monthly or weekly basis. Price £8.50.

All-in-rate Calculator works out costs to employ including "gang" rates, price £15, while Electronic Price Book, at £45, allows operators to control and store their own personal price.

A Dutch treat for Electron fans

ELECTRONICS manufacturer Slogger has snubbed the prestigious PCW show in favour of the Electron & BBC Micro User Show and a one-day event in Holland.

Barry Johnson, sales manager of Slogger said: "The Electron & BBC Micro User Show and the Dutch event are far more important to our company".

The show in Holland – known as the Annual Day – is run entirely by Electron users and has grown in size over the past five years to become one of the most important events in the computing calendar. It attracts thousands of visitors from all over Europe.

From its early beginnings it has reached the stage where organisers are already looking for larger premises to cater for the ever increasing number of visitors.

Holland has the biggest Electron user base outside of the UK and accounts for over £100,000 in sales each year for Slogger.

"Our Dutch customers are very loyal to us and we feel it our duty to support the event. In one day we sell more than we could in three days at the PCW show", said Barry.

Even though Holland is a big customer for Slogger the Dutch won't be the first to see the company's new products which are going to be launched at the pre-Christmas Electron & BBC Micro User Show at the New Horticultural Hall in London, November 13-15.

Electron owners are being catered for with a new disc interface which has a standard Acorn DFS.

For the first time on the Electron there is a type-ahead facility which means that the operator doesn't have to wait for the disc drive to finish before being able to use the computer.

Electron buff is 87

THE hunt for Britain's oldest Electron user could be over.

Compared to London resident Alan Smith, the previous contenders – 73-year-old Ron Panting and 78-year-old Allan Stevens – are mere boys.

For Alan was born in 1900, when Queen Victoria still reigned, the Boer War was raging in South Africa, and one third of the world map was coloured British Empire pink.

Long afterwards, he was nearing the end of his career when computers first began to be used in industry. "The company for which I worked was in the van of that development", he told *Electron User*. "But it differed from almost every other firm in the uses to which computers were put.

"Most companies regarded them as adjuncts to the accountancy system, but my firm felt they were better employed on problems related to construction, production, research and the like. It was only when they became more reliable that they were used for accounting records".

Alan's Electron came from the first batch to reach the shops. "My sole purpose in buying it was to establish whether or not 20 years of retirement had left me an intellectual cabbage," he said.

Having reassured himself on that point he set about extending the system. It now comprises Electron, Plus 1, Plus 3 and second processor.

"Like Allan Stevens I have no interest in games", he said. "My interests lie in word processing with View and the many ramifications of graphics, for which the Electron is ideal".

Schools in stitches

SCHOOLS and colleges have been rushing to buy Knitwear Designer, the program that allows users to create stylish sweaters on the Electron.

Teachers have recognised the program's potential value within the home economics syllabus – particularly for the new GCSE examination.

Education establishments from Glasgow to Plymouth began the new school year by familiarising themselves with the software, which costs £8.95 on tape and £9.95 on disc.

Typical of schools using Knitwear Designer is Kitwood Girls School in Boston, Lincs.

Head of home economics Margaret Barsley said: "The program will help our girls design and produce their own garments – drafting individual patterns to their own sizes – and prepare them for the GCSE textiles exam".

Christine Carter, head of the textile department at Thomas Lord Audley School, Colchester, said: "I'm looking forward to fitting Knitwear Designer into the GCSE home economics programme for our fourth and fifth years".

THE GALLUP CHART TOP 10

ELECTRON SOFTWARE

THIS MONTH	LAST MONTH	TITLE (Software House)	PRICE
1	1	AROUND THE WORLD IN 40 SCREENS *Superior*	6.95
2	4	SUPERIOR COLLECTION VOL 2 *Superior*	9.95
3	2	PAPERBOY *Elite*	9.95
4	3	FOUR GREAT GAMES *Micro Value*	3.99
5	5	CODENAME DROID *Superior*	9.95
6	7	STRYKER'S RUN *Superior*	9.95
7	•	SOCCER BOSS *Alternative*	1.99
8	•	CRAZEE RIDER *Superior*	9.95
9	6	FIVE STAR GAMES 2 *Beau Jolly*	9.95
10	9	OLYMPIC SPECTACULAR *Alternative*	1.99

Compiled by Gallup/Microscope

New entries this month are from Alternative and Superior with Soccer Boss and Crazee Rider. Last month's new entry, Stryker's Run, is moving slowly upwards, while Around the World in 40 Screens keeps the number one position.

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	~~£124.85~~

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Making your pulse race

In the last instalment in the series on constructing the Electron User buggy JOE PRITCHARD devlops the software

THIS month it's time to finish off the *Electron User* buggy by looking at the software that we need to drive it.

The buggy's motors are driven by a series of pulses, giving some degree of control over its speed. To generate these pulses, we're going to use one of the timers provided by the 6522 VIA in the Plus 5.

This is called timer one, and among its other functions, it can be programmed to provide a square wave of variable frequency and mark/space ratio on the PB7 output under interrupt control.

This simply means that pulses are provided without us having to do anything except carry out a few pokes to set up the timer.

After each pulse is generated, an interrupt signal from the 6522 VIA causes the the 6502 processor in the Elecron to leave whatever it's doing, run a separate machine code routine and then resume its original job.

In this particular application, the machine code program simply loads the timer's registers with the duration, in microseconds, of the next pulse. To go into detail about the VIA timers would easily fill the rest of this magazine, so we'll leave that for a future issue.

Figure I shows the connections we need to make between the buggy and the interface terminal box.

Program I is a procedure suitable for driving the motors, specifically written for an ACP Plus 5. For a different user port, the addresses of the VIA registers may need to be changed.

The values placed in *hightime* and *lowtime* should be experimented with to get an appropriate speed. The larger the value in *hightime*, or the lower the value in *lowtime*, the higher the speed at which the motors will rotate.

These values control what is known as the mark/space ratio of a square wave, illustrated by Figure II. The mark is the period of time the output spends at five volts, two microseconds in this case, and the space the time it spends at zero volts.

In the case of the buggy, the longer the motor remains on (the longer the mark) the faster it will revolve.

At very low speeds, the motors won't start up reliably, simply because they're not switched on for long enough.

Program I should be called during initialisation and the machine code that it produces used by the move procedure - Program II, which is called in the following fashion:

```
200 PROCmove(left,right,time)
```

where *left* and *right* indicate the direction the motors are to run in, and *time* indicates the length of time you want the motors to be on.

On the prototype, the motors were wired so that a logic zero signal to the direction input would cause the motors to pull the buggy forward and a logic one applied to the direction lines would cause the motors to run backwards.

The following three commands move the buggy forward, right and left respectively:

```
PROCmove(0,0,time)
PROCmove(0,1,time)
PROCmove(1,0,time)
```

So, to run the buggy forward for about five seconds type:

```
PROCmove(0,0,500)
```

The timing cannot be calculated exactly because the interrupts cause the variable TIME to be updated

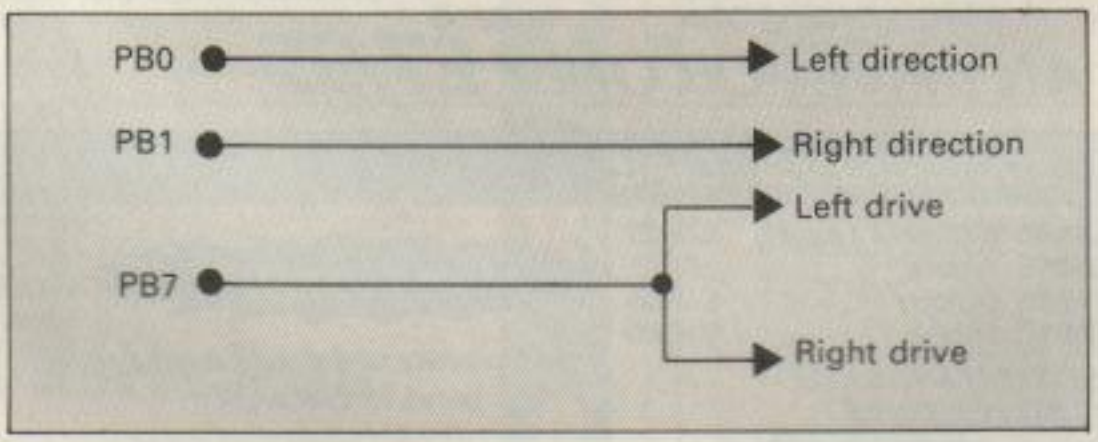


Figure I: Connections between the buggy and interface terminal box

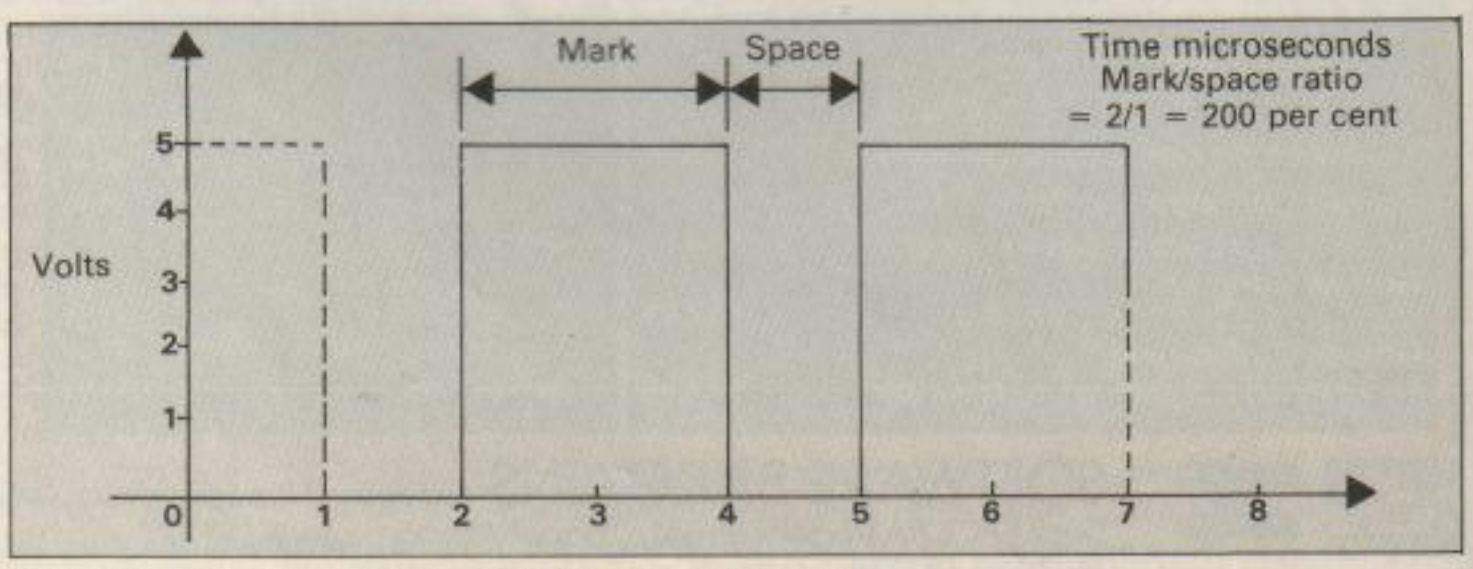


Figure II: Illustrating the mark/space ratio of a square wave

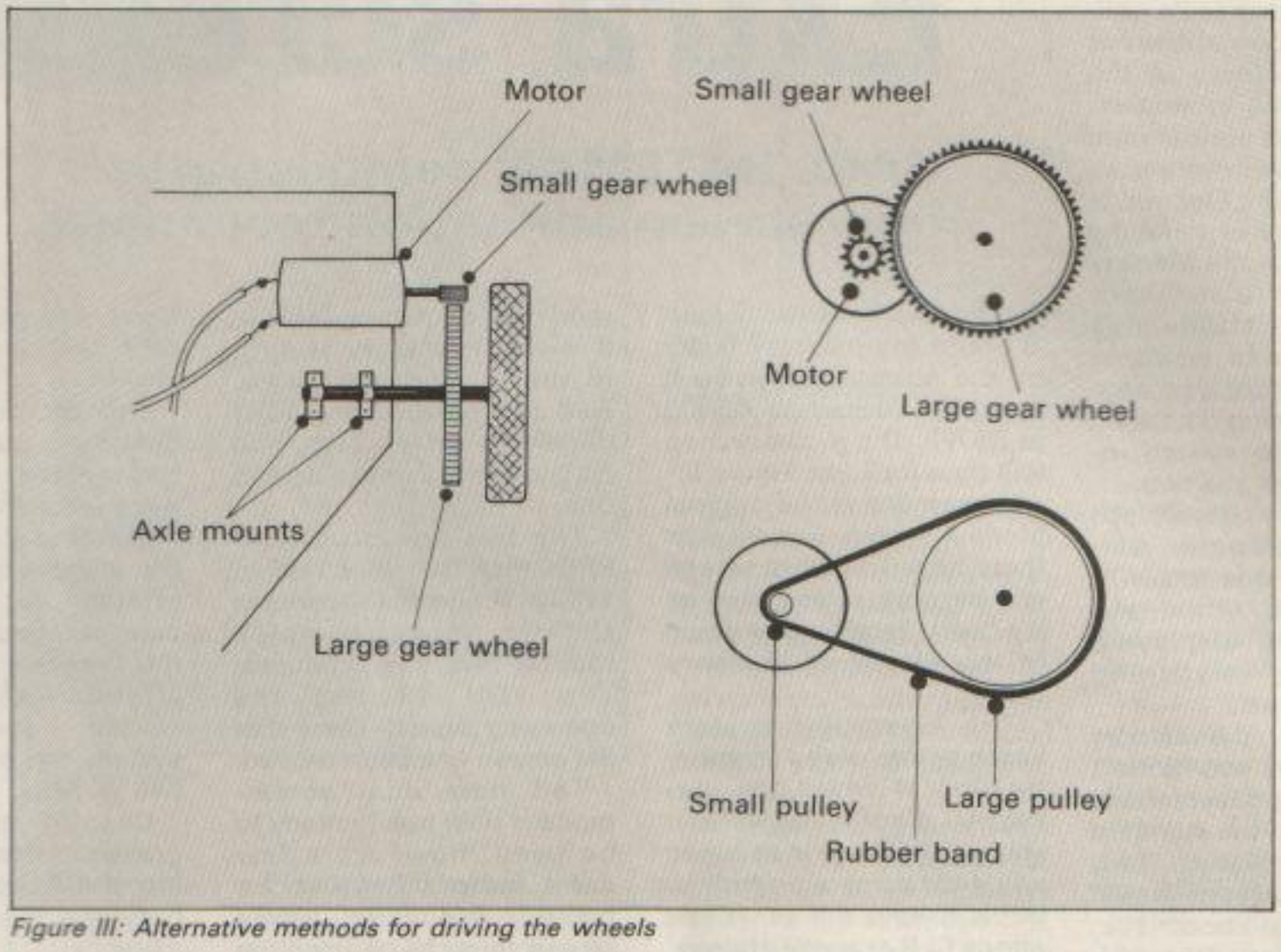


Figure III: Alternative methods for driving the wheels

slightly less frequently than it should be. Thus, the actual time the motors will rotate for will be more than five seconds.

The faster the motors run, the slower TIME will be updated. A little trial and error will be required while working out how much adjustment the time parameters need. Once this is known, a function can be written to calculate motor on time for a given motor speed.

To give the buggy more traction, thus allowing it to run on different surfaces and even up slight slopes, try gearing the motors down as shown in Figure III.

Each rotation of the motor shaft gives only a small rotation of the wheel, so the motors run more quickly. The gears can be from an old toy car or Technical Lego, but the same gear ratio must be used on each wheel.

The small gear is driven by the motor and meshes with the large gear which drives the driving wheel. However, it may be necessary to modify the chassis to accommodate the gearing. As an alternative to gears, a thick rubber band and a couple of vee pullies will do just as well.

Finally, you might like to use the analogue port on the Plus 1 and add a light sensor or a collision detecting microswitch. We looked at how to interface such devices to the Plus 1 earlier in this series, between January and June 1987.

Well, that's it for the buggy. It's something to experiment with and develop a variety of programs for.

● *Next time it's back to the Plus 1 with some software to draw graphs based on readings from the analogue port – useful for school science labs and good fun.*

```
1000 DEFPROCassemble
1010 ?&FCB2=255
1020 T1CL=&FCB4
1030 T1CH=&FCB5
1040 T1LL=&FCB6
1050 T1LH=&FCB7
1060 ACR=&FCBB
1070 IR=&FCBD
1080 IER=&FCBE
1090 flag=&70
1100 lowtime=&71
1110 hightime=&73
1120 DIM code% 200
1130 FOR pass=0 TO 2 STEP 2
1140 P%=code%
1150 [OPT pass
1160 .interrupt
1170 PHA
1180 LDA T1CL
1190 LDA #0
1200 CMP &70
1210 BEQ low
1220 LDA #0
1230 STA &70
1240 LDA hightime
1250 STA T1LH
1260 STA T1LL
1270 PLA
1280 CLI
1290 RTI
1300 .low
1310 LDA #1
1320 STA &70
1330 LDA lowtime
1340 STA T1LL
1350 STA T1LH
1360 PLA
1370 CLI
1380 RTI
1390 .start
1400 LDA #&C0
1410 STA ACR
1420 LDA #&3F
1430 STA IER
1440 LDA #&C0
1450 STA IER
1460 LDA #interrupt MOD 256
:STA &206
1470 LDA #interrupt DIV 256
:STA &207
1480 LDA #0:STA &70
1490 LDA &71
1500 STA T1CL
1510 STA T1CH
1520 LDA &73:STA T1LL
1530 STA T1LH
1540 RTS
1550 .off
1560 SEI
1570 LDA #0:STA ACR
1580 LDA#0:STA &FCB0
1590 CLI
1600 RTS
1610 ]
1620 NEXT
1630 ENDPROC
```

Program I

```
2000 DEFPROCmove(left,right
,duration)
2010 byte=0
2020 IF left=1 byte=byte+1
2030 IF right=1 byte=byte+2
2040 ?&FCB0=byte
2050 CALL start
2060 TIME=0
2070 REPEAT
2080 UNTIL TIME>duration
2090 CALL off
2100 ENDPROC
```

Program II

Extra screens

CARL BATEMAN demonstrates dual screen animation techniques

ONE of the advantages the BBC Master claims to have over the Electron is its ability to hold two different screens in memory at the same time, one in shadow ram and one in normal ram.

This isn't true however, as we'll see and the Electron is just as capable of handling dual screens as the Master.

The Master also has a range of commands allowing you to write or draw to either screen, whether it's being displayed or not, and to switch instantly between the two.

This lends itself to extremely smooth animation where one screen is being altered while the other is being displayed, and rapidly switching between the two.

Unfortunately, the memory needed to store two Mode 1 screens is 40k, substantially more ram than the standard Electron possesses. Two Mode 4 or 5 screens would only take up about 20k, exactly the same as one Mode 1 screen, so there is ample room to fit them into the available ram.

In fact it turns out that emulating the dual screens of the Master is well within the capabilities of the Electron, as long as only Modes 4, 5 and 6 are used. To achieve the dual screen mode we need three things:

- The memory to store the extra screen.
- A method of displaying either screen.
- A method of writing to either screen.

Looking at how the Electron's memory is divided in Figure I, the most obvious place to put the extra screen is under the memory taken by the normal screen so it occupies addresses &3000 to &57FF. The memory map will then look like Figure II.

Screen one is the original Mode 4 screen, since it was there first. The extra screen will become screen zero as it's been placed lower down in the Electron's memory map.

The operating system keeps a note of the memory location at which the currently displayed screen starts. This value is changed when the screen is scrolled, but is always the same just after a CLS or mode change. The value of the screen start address is kept in locations &FE02 and &FE03.

From this, it can be deduced that by poking the appropriate values shown in Table I, into &FE02 and &FE03, the operating system can be fooled into displaying another area of memory as though it were screen memory, in this case screen zero.

The way the screen start address is stored is a little strange, it's divided by two, the high byte being stored in &FE02 and the low byte in &FE03.

Since the contents of &FE02 remain constant it is only necessary to poke &30/2 into &FE03 to fool the operating system into displaying screen zero. In Basic this gives the surprisingly simple three line procedure PROCdispscr(T%) in Program I, lines 1000-1020.

The operating system also keeps track of where in memory to send all VDU commands. This time only the high byte of the screen start address is stored – in two locations, &34E and &351.

The values held for each mode are shown in Table II. It is only necessary to poke in the appropriate value, &30 to redirect the VDU drivers to screen zero, and &58 to send them to screen one.

The five line procedure PROCaltsr(T%), lines 1100 to 1140 in Program I shows the slightly more complex routine that this produces. The VDU 13 lets the operating system know that the screen has been moved.

The new dual screen mode is now nearly ready to be used, however a few extra factors have to be borne in mind. First, before screen zero can be used the memory it will occupy, from &3000 to &57FF has to be cleared and protected.

This is achieved with the following Basic line placed at the start of the program:

```
30 MODE1:MODE4:HIMEM=&3000
```

While the operating system is being very accommodating in letting us fiddle with it, at the moment if hardware scrolling occurs – for instance when listing a program – the operating system will become confused and parts of screens zero and one will be displayed.

This can be overcome by defining a text window and making the Electron software scroll instead.

Bringing all this together, can achieve quite satisfying effects such as those demonstrated by Programs I-V. Program I is a demonstration showing how quickly the operating system can switch between two screens.

Despite a fair bit of graphics information, pressing the S key will switch between the two screens instantly.

To prove that the two screens are present in memory at the same time, pressing R will roll the display between the two.

Programs II and III give practical demonstrations of animation, with a smoothly bouncing ball and a smoothly rotating square respectively.

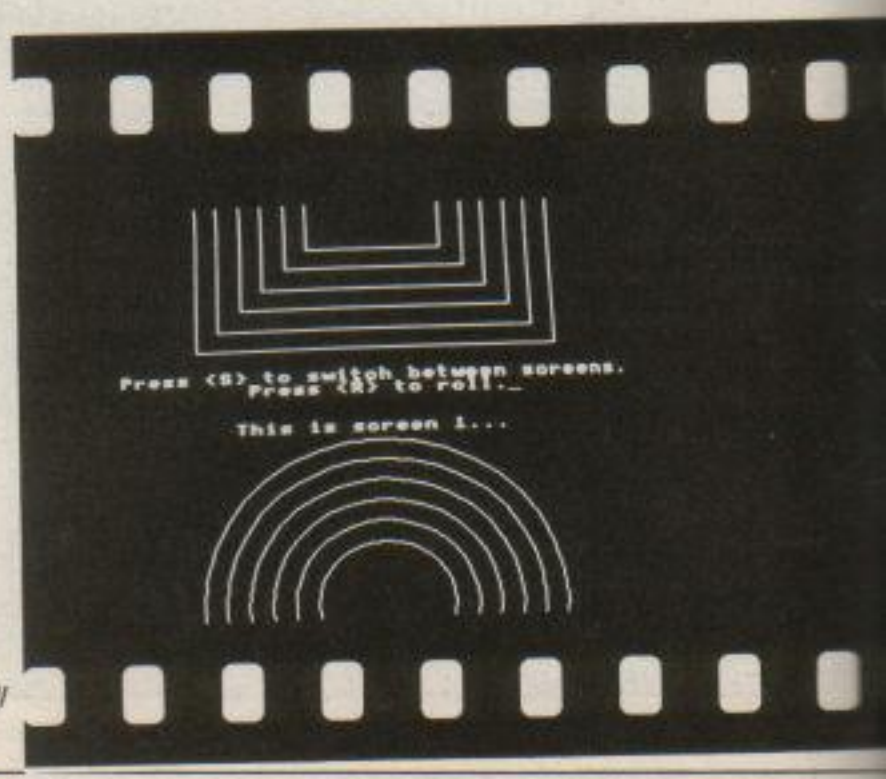
While similar effects can be achieved with palette switching, this would involve using a multicolour mode. Modes 1 and 2, are rather slow and Mode 5

MODE	&FE03	&FE02
0/1/2	&18	&00
3/4/5	&2C	&00
6	&30	&00

Table I: The contents of the screen start register

MODE	&34E and &351
0,1,2	&30
3	&40
4,5	&58
6	&60

Table II: The screen start address



A Mode 4 screen scroll in action

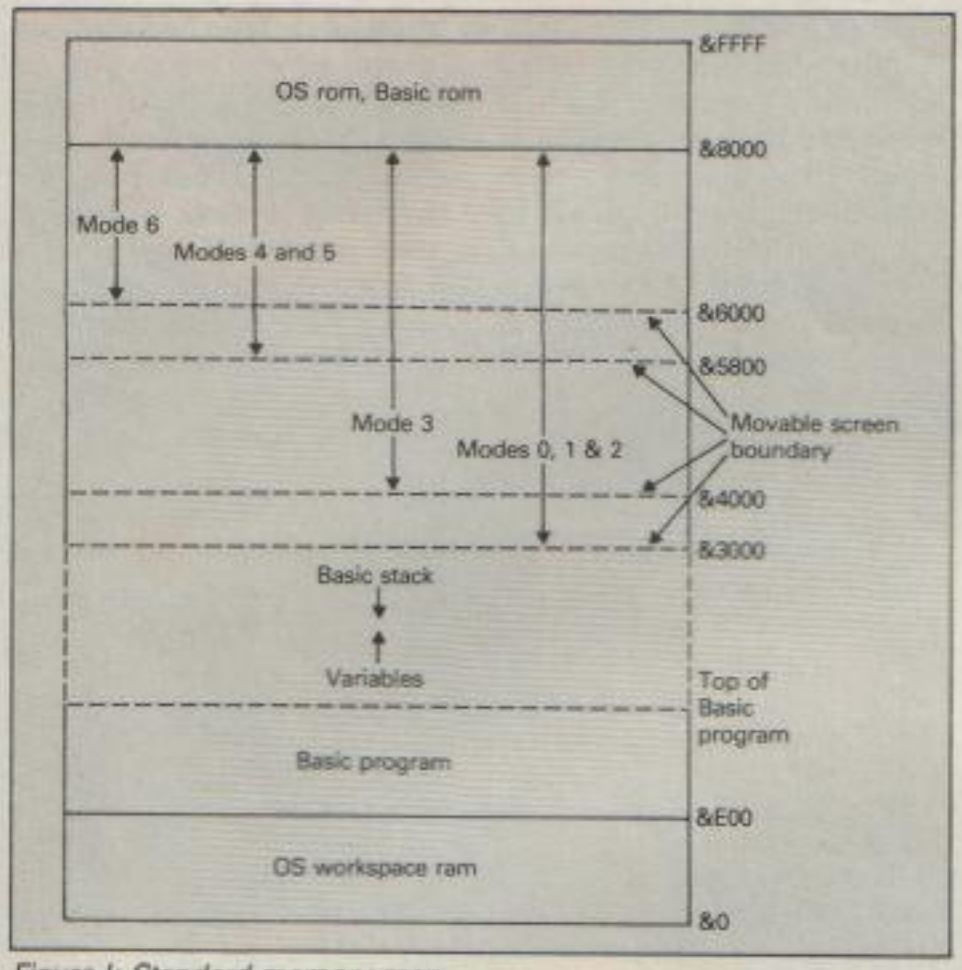


Figure I: Standard memory map

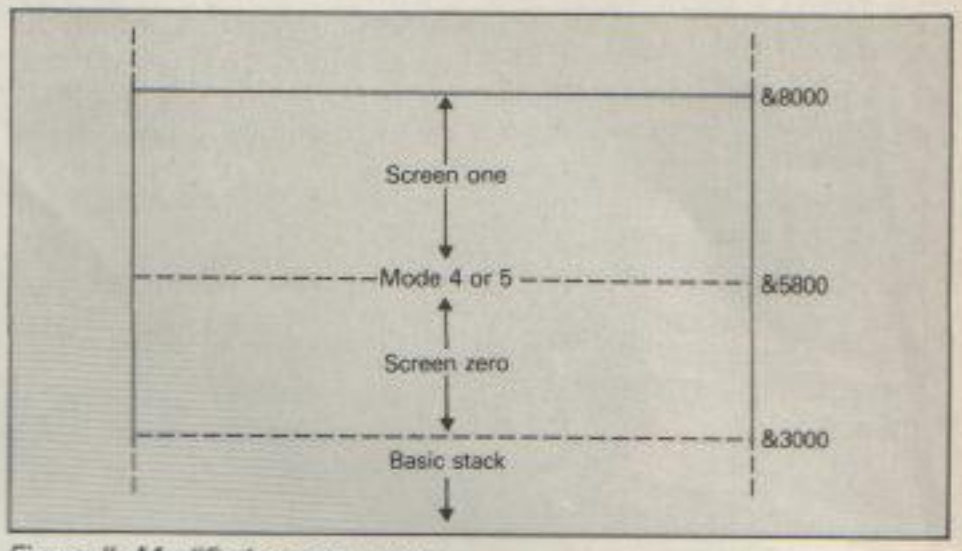


Figure II: Modified memory map

tends to give a rather coarse effect.

Although Mode 4 has been used for these demonstrations, Mode 5 could be used just as easily.

Mode 6 can benefit from dual screens, too, though without the benefit of graphics. These are the changes to procedures:

```
1000 DEF PROCdispscr(T%)
1010 ?&FE03=&20+&10*T%
1030 ENDPROC
```

```
1100 DEF PROCaltscr(T%)
1110 ?&34E=&40+&20*T%
1120 ?&351=&40+&20*T%
1130 ENDPROC
```

Finally, two rather interesting though more limited applications of changing the screen start address register by direct poking are sideways hardware scrolling and a rather unique machine memory monitor.

Program IV demonstrates that by incrementing the screen start address it is possible to achieve limited sideways scrolling.

Unfortunately, 64 is the smallest change in the start address that the operating system will notice, so the effect is quite jerky.

This scroll will work in any program although the best effect is achieved in Mode 0. The screen also tends to roll up or down, so any programs using this technique need to take account of this.

This happens when the screen start address has been increased by the total number of bytes used for a whole line.

In Modes 0, 1, 2, and 3 this is after each increase of &280 bytes, or 10 sideways moves, while in Modes 4, 5, and 6 it's &140 bytes, or five moves.

This could be overcome by simply resetting the screen start to its correct value after a certain number of moves.

The lowest value that can be poked into &FE02 is four and as you might expect, the operating system dutifully displays &800 onwards as screen memory.

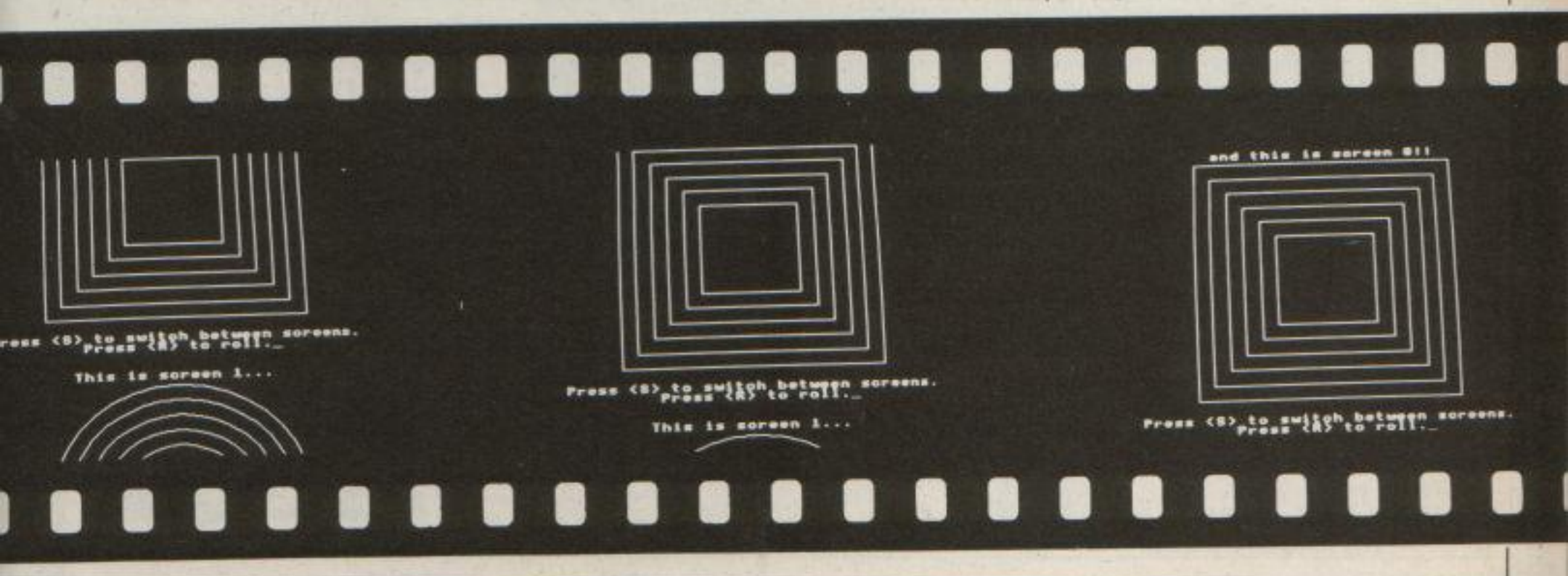
As you may already know only the memory between &3000 and &7FFF is intended mainly for high resolution screen use, all the remaining ram having a variety of other uses. For instance the area extending down from the bottom of the screen memory is used for the Basic stack.

Basic programs themselves on a cassette based system usually start from &E00, although this will change, if for example, the character font is exploded or the ADFS is in use.

Basic variables are kept in the ram extending from LOMEM (which is usually equal to the top of Basic program pointer TOP) up to the bottom of the Basic stack.

Other interesting areas of ram are from &800 to &8FF which is used as sound workspace and the default printer buffer. Function key definitions are stored from &B00 to &BFF and character definitions between &C00 and &CFF.

Turn to Page 12 ▶



Programming

◀ *From Page 11*

Program V selects Mode 0, sets the screen start address to &800, and defines a text window so that you can see what you're typing in.

All that garbage at the top of the screen is the Electron's ram from &800 onwards.

For a more graphic demonstration, save the program and enter NEW. Now dimension an array with:

```
DIM A(100)
```

and part of the garbage should disappear, this is Program V being erased from memory. Typing in NEW resets Basic's variable TOP to PAGE+2.

When you DIM the array to reserve memory, the first available ram at LOMEM is used, in this case from PAGE+2 upward, erasing the program in the process.

Any attempt to retrieve it with OLD, will result in the error message "Bad program".

Enter NEW again, and type in a few lines of program, as you do so you can see it growing in memory.

Defining characters, function keys, envelopes, and running a few programs with nested loops or even recursion, cause some very interesting effects to appear. Don't use a Mode command though or the screen will be reset to normal. ■

Program I

```
  10 REM Program I
  20 REM Dual Screens
  30 MODE1:MODE4:HIMEM=&3000
  40 VDU28,0,31,39,0
  50 S$="Press <S> to switch
between screens."
  60 R$="Press <R> to roll."
  70 PRINTTAB(10,2)"This is s
creen 1..."
  80 PRINTTAB(2,30);S$:PRINTT
AB(11);R$;
  90 FORR%=150 TO 400 STEP 50
 100 PROCcircle(R%)
 110 NEXT
 120 PROCdispscr(0)
 130 PROCaltscr(0)
 140 PRINTTAB(9,2)"and this i
s screen 0!!"
 150 PRINTTAB(2,30);S$:PRINTT
AB(11);R$;
 160 FORW%=150 TO 400 STEP 50
 170 PROCbox(W%)
 180 NEXT
 190 S%=1
 200 REPEAT
 210 A$=GET$
 220 IF A$="S" THEN PROCdisps
cr(S%)
 230 IF A$="R" THEN PROCroll(
S%)
 240 S%=(S%+1)MOD2
 250 UNTIL FALSE
 260 :
1000 DEF PROCdispscr(T%)
1010 ?&FE03=&18+&14*T%
1020 ENDPROC
1030 :
1100 DEF PROCaltscr(T%)
1110 ?&351=&30+&28*T%
1120 ?&34E=&30+&28*T%
1130 VDU13
1140 ENDPROC
1150 :
1200 DEF PROCcircle(R%)
1210 LOCAL X,Y,S,C
1220 X=R%:Y=0
1230 S=SINRAD1:C=COSRAD1
1240 MOVE X+640,Y+512
1250 FOR A%=1 TO 36
1260 T=Y
1270 Y=Y*C-X*S
1280 X=T*S+X*C
1290 DRAW X+640,Y+512
1300 NEXT
1310 ENDPROC
1320 :
1400 DEF PROCbox(W%)
1410 MOVE 640+W%,512+W%
1420 DRAW 640-W%,512+W%
1430 DRAW 640-W%,512-W%
1440 DRAW 640+W%,512-W%
1450 DRAW 640+W%,512+W%
1460 ENDPROC
1470 :
1500 DEF PROCroll(S%)
1510 IF S%=0 A%=&5800 ELSE A%
=&3000
1520 IF S%=0 THEN C%=-320 ELS
E C%=320
1530 FORI%=0 TO 31
1540 A%=A%+C%
1550 *FX19
1560 ?&FE03=A% DIV 512
1570 ?&FE02=(A% MOD 512) DIV
2
1580 NEXT
1590 ENDPROC
```

Program II

```
  10 REM Program II
  20 REM Bouncing ball
  30 MODE1:MODE4:HIMEM=&3000
  40 VDU28,0,31,39,0
  50 VDU23,255,&1807;&4020;&8
040;&8080;
  60 VDU23,254,&18E0;&0204;&0
302;&0303;
  70 VDU23,253,&8080;&4080;&2
040;&071F;
  80 VDU23,252,&0707;&1E0F;&F
CAE;&E0F8;
  90 VDU5
 100 A$=CHR$(255)+CHR$(254)+C
HR$(8)+CHR$(8)+CHR$(10)+CHR$(2
53)+CHR$(252)
 110 Y%=1016:X%=RND(26)*36
 120 V%=0:O%=Y%
 130 P%=X%:C%=36
 140 REPEAT
 150 PROCdispscr(1)
 160 PROCaltscr(0)
 170 PROCerase
 180 PROCmove
 190 PROCdispscr(0)
 200 PROCaltscr(1)
 210 PROCerase
 220 PROCmove
 230 UNTIL0
 240 :
1000 DEF PROCdispscr(T%)
1010 ?&FE03=&18+&14*T%
1020 ENDPROC
1030 :
1100 DEF PROCaltscr(T%)
1110 ?&351=&30+&28*T%
1120 ?&34E=&30+&28*T%
1130 VDU13
1140 ENDPROC
1150 :
1200 DEF PROCmove
1210 IF Y%<=60 V%=-V% ELSE V%
=V%+8
1220 Y%=Y%-V%
1230 X%=X%+C%
1240 IF X%<=0 OR X%>=1000 THE
N C%=-C%
1250 MOVE X%,Y%
1260 GCOL0,1
1270 PRINT A$
1280 ENDPROC
1290 :
1400 DEF PROCerase
1410 GCOL0,0
1420 MOVE P%,O%
1430 PRINT A$
1440 O%=Y%
1450 P%=X%
1460 ENDPROC
```

Program III

```
 10 REM Program III
 20 REM Spinning square
 30 MODE1:MODE4:HIMEM=&3000
 40 VDU28,0,31,39,0
 50 VDU29,640;512;
 60 X%=0:Y%=200
 70 REPEAT
 80 PROCdispscr(1)
 90 PROCaltscr(0)
100 PROCerase
110 PROCspin
120 PROCdraw
130 PROCdispscr(0)
140 PROCaltscr(1)
150 PROCerase
160 PROCspin
170 PROCdraw
180 UNTIL 0
190 :
1000 DEF PROCdispscr(T%)
1010 ?&FE03=&18+&14*T%
1020 ENDPROC
1030 :
1100 DEF PROCaltscr(T%)
1110 ?&351=&30+&28*T%
1120 ?&34E=&30+&28*T%
1130 VDU13
1140 ENDPROC
1150 :
1200 DEF PROCsquare(X%,Y%)
1210 MOVE X%,Y%+200
1220 DRAW -X%,-Y%+200
1230 DRAW -X%,Y%-200
1240 DRAW X%,-Y%-200
1250 DRAW X%,Y%+200
1260 ENDPROC
1270 :
1300 DEF PROCdraw
1310 GCOL0,1
1320 PROCsquare(X%,Y%DIV4)
1330 ENDPROC
1340 :
1350 DEF PROCerase
1360 GCOL0,0
1370 PROCsquare(U%,V%DIV4)
1380 ENDPROC
1390 :
1400 DEF PROCspin
1410 U%=X%:V%=Y%
1420 X%=X%+Y% DIV 8
1430 Y%=Y%-X% DIV 8
1440 ENDPROC
```

Program IV

```
  10 REM Program IV
  20 REM Sideways scroll
  30 MODE0
  40 S%=HIMEM
  50 PRINTTAB(15,5)"This is i
s a simple demo showing sidewa
ys scrolling."
  60 PRINTTAB(19,10)"Use the
< > keys to move this display.
.."
  70 FOR X%=0 TO 500 STEP 50
  80 MOVE X%+400,50
  90 DRAW 900,X%+50
 100 NEXT
 110 REPEAT
 120 A=GET
 130 IF A=44 C%=64
 140 IF A=46 C%=-64
 150 S%=S%+C%
 160 IF S%<=HIMEM S%=&8000
 170 IF S%>&8000 S%=HIMEM
 180 T%=S% DIV 2
 190 H%=T% DIV &100
 200 L%=T% MOD &100
 210 *FX19
 220 ?&FE02=L%
 230 ?&FE03=H%
 240 UNTIL 0
```

Program V

```
10 REM Program V
20 REM Peeking OS ram
30 MODE 0
40 ?&FE03=4
50 VDU28,0,14,60,0
```

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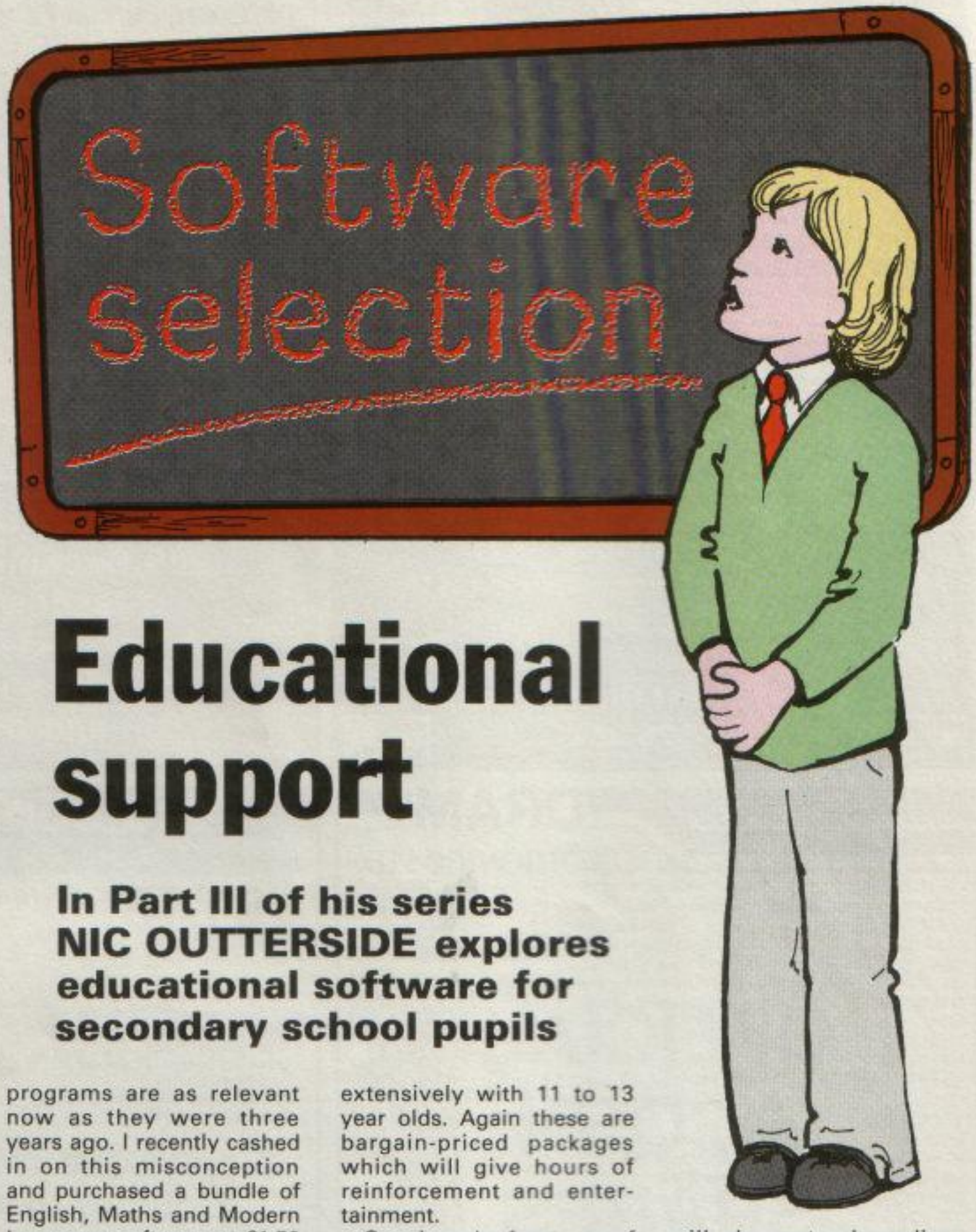


Educational support

In Part III of his series NIC OUTTERSIDE explores educational software for secondary school pupils

WE have so far looked at the availability and quality of educational software for the nursery and primary age range.

This month I wish to examine the software available for the much more complex and specialised field of secondary education.

The quantity of software for this age group is more limited for the Electron as most publishers tend to follow the philosophy that all secondary school children have access to a BBC Micro 24 hours a day.

However, that is not to say there isn't some excellent Electron educational software that can be bought at reasonable prices for your teenager.

Most software aimed at the older school pupil is of a text-numeric only variety and if you have a Slogger Master Ram board fitted to your Electron it is possible to run a number of previously exclusive BBC Micro programs.

This past year has seen a revolution in secondary education which has affected pupils from the first year to the upper sixth in all schools throughout the land.

That revolution has been encompassed by the demise of the O Level and CSE examinations and the birth of the GCSE Exam/assessment system. This imposed change has frightened parents, terrified some teachers and left questions in all our minds.

It has also prompted many software publishers to sell old O Level/CSE titled packages at give-away prices in the belief that they are now obsolete.

Nothing could be further from the truth. Although the method of examination, assessment and bias has changed in most of the subjects, the actual core material has altered very little.

Therefore, most of these programs are as relevant now as they were three years ago. I recently cashed in on this misconception and purchased a bundle of English, Maths and Modern Language software at £1.50 each, when their original retail price was well over £15 per item.

It is perhaps in the field of English and Communications Studies that the greatest range of software exists for the Electron.

Many of the packages mentioned in last month's column could be used for remedial purposes with older children, particularly Golem's Fun with Words and some of the Database Publications' programs.

I have used Punctuation, Bridge, Discover, Gottit, Punctuation and There extensively with 11 to 13 year olds. Again these are bargain-priced packages which will give hours of reinforcement and entertainment.

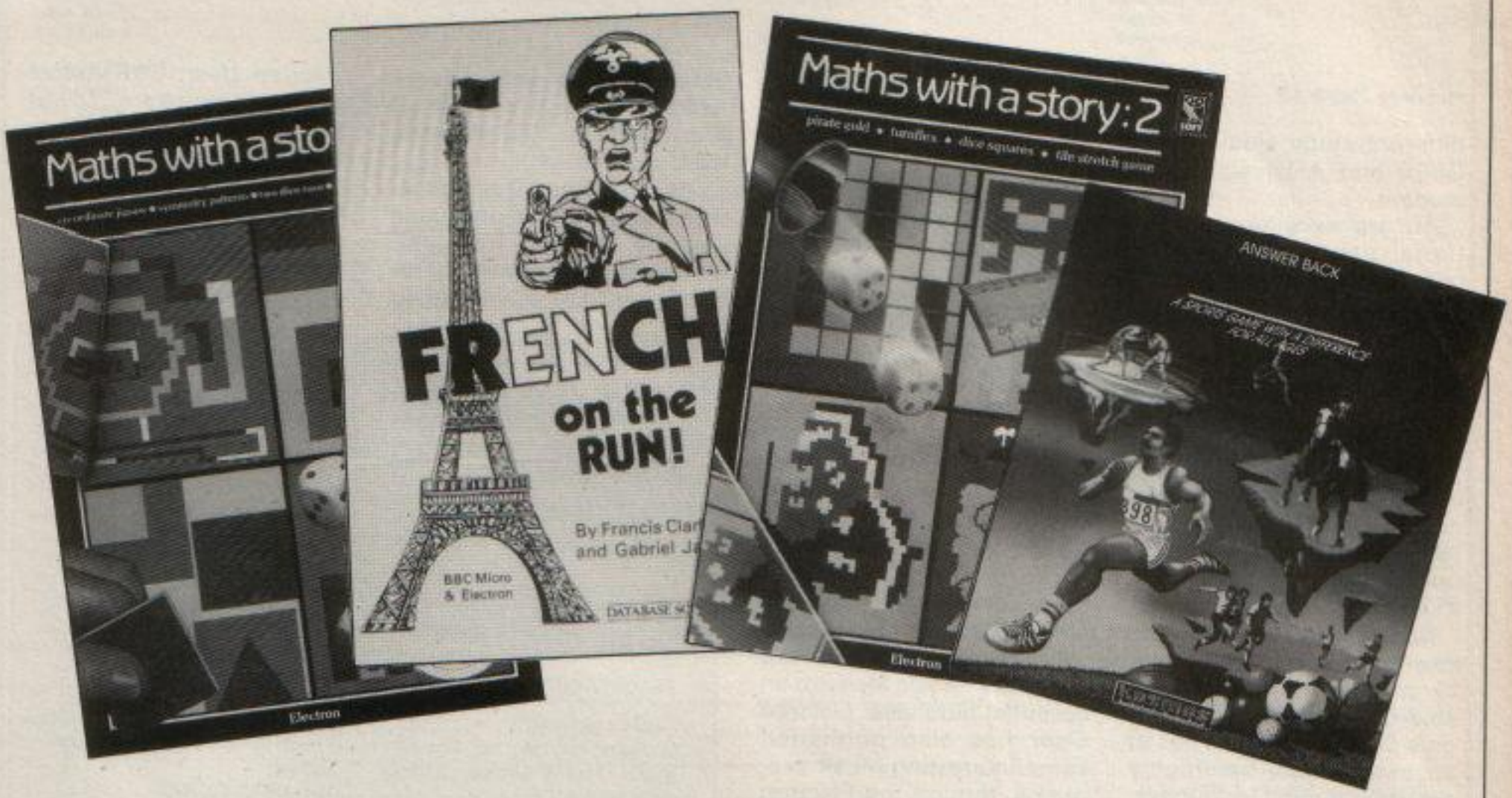
On a broader front, use of databases and wordprocessors will extend writing and organisational capacity. The choice of such utilities is vast, with Database Publications' Mini Office, Acornsoft's View and Slogger's Starword and Starstore perhaps heading the pecking order.

Acornsoft's Talkback program, available for only £1.50 will expand sentence structure, written speech development and imagination beyond the realms of pen and paper.

As previously mentioned, playing with text adventures will also extend reading, comprehension, decision making and spelling. You won't go far wrong with any Robico, Larsoft or Epic release – though don't be surprised if you become hooked on this past time as well.

For the older teenager, the examination revision software for English is particularly healthy. Acornsoft's Ivan Berg English Revision includes sections on spelling, letter writing, comprehension, essays, summary and common mistakes.

It can now be bought for



as little as £1.85 from some mail order companies and such a price is irresistible when you consider the package includes two cassettes with an excellent support booklet.

LCL's Micro English includes 24 programs and is suitable for the GCSE English student, although the price of £24.50 may discourage parents.

If you have a Slogger Master Ram board and ACP Plus 4 or Cumana and SEDFS fitted to your Electron, the world of BBC English programs becomes your oyster.

The range of Akadimias Software's English Literature discs includes: Antony and Cleopatra, The Tempest, Henry IV Part one, Mansfield Park, The Trumpet Major, JMB Poems, Hamlet, Chaucer's Prologue, Rape of the Lock, Gerald Manley Hopkin's Poems and The Importance of Being Earnest.

New titles are being added all the time and providing you have the necessary hardware, these text-only offerings are among the best literature software available for any computer.

In the faculty of mathematics, once again the scope of software is vast. Database Publications' Classroom Computing Volumes one and two include many maths programs which are superb back-up tools.

Angler, Matrix, Manipulation, Fun Factors and What Number spring instantly to mind as being ideal for secondary school pupils.

Many of the card and dice games published in back issues of Electron User can be used wisely to build up numeracy skills.

I currently have two 17-year-old private students addicted to the Electron versions of Yams and Blackjack. Their numeracy has improved to such an extent they have been sailing through the more complicated computations in preparation for their Maths O level resit this month.

Even playing Acornsoft's Elite has been known to improve calculatory skills in youngsters!

BBC Soft's Maths with a Story 2 is also an excellent piece of software which really makes maths fun.

Acornsoft's Ivan Berg Mathematics Revision one and two are essential learning/revision aids for 15 and 16 year-olds.

As with the English package they can be bought for as little as £1.85 each and include work on arithmetic, algebra, geometry, statistics, sine, cosine and tangent rules, matrices and probability.

And, Acornsoft's Business Games and Personal Money Management are advertised at only £1.50 and should give enjoyment to the older Maths and Economics students.

LCL's Micro Maths is perhaps rather more extensive, but like its English sister, retails at £24.50.

Modern language students are fortunate in the extent of software currently on the market for the Electron. Database Publications' French on the Run is a marvellous piece of interactive text adventure

French is my weakest subject – I regularly came 32nd out of 32 in my French set at school – yet I can't leave this program alone and often sit glued to the screen with an atlas in one hand and a French dictionary in the other.

Meanwhile, Chalksoft's Eiffel Tower is a novel way of teaching French, though is perhaps aimed more at the casual student rather than designed for exam revision purposes.

Acornsoft's Linkword French, German, Spanish and Italian come into the same category as the Ivan Berg series and can be bought ridiculously cheaply. They are excellent and should not be missed.

Cosmos Software's The Spanish Tutor, The French Mistress and The German Master are also excellent teaching aids. Each gives 16 orthodox language lessons and can't be ignored at only £8.95 each.

LCL also produces a Micro French package, which I whole-heartedly recommend to the more affluent among you, as they are priced at the same level as LCL's English and Mathematics software.

History student's should be aware of LCL's Sir Francis Drake adventure which is only £6.95. However, the vast majority of good quality history software is only available on BBC disc. For Master Ram board and 5.25in disc users, Akadimias Software produces over 15

Turn to Page 20 ▶

Education

◀ *From Page 19*

different study aids for the GCSE and A Level history student.

All are excellent educational value as bulk discounts can be arranged with the company's base at Bangor University.

The Fernleaf BBC series should also run on 64k Electrons, but please check before you buy.

Geography devotees can choose from a wider range of standard Electron cassettes including Micropower's Where at only £1.80.

Kosmos Software's Answer-Back series offers a lot to geography and general studies pupils and, costing only £8.95 with Fact Files at an extra £4.95, are highly entertaining and instructive.

Macsen's Treasure Hunt is in a similar vein and will attract whole family participation. Shard's Operation Safras goes some way towards supporting British geography, though I would be interested to hear of any company which has expanded upon the idea.

Science software proliferates and Micro-Power's Which Salt is a bargain at £1.50. H&H Software's Letts Keyfacts Physics and Chemistry are based on the famous Letts revision aids.

Both include multiple-choice questions, are quite comprehensive for fifth form science students and are priced at £11.50.

Musicians must find Mupados' Music Maestro an essential purchase. *Electron User* has also published some interesting music programs, though the Electron is rather limited musically, having only one music channel. Keyboard Player in the February 1987 issue is well worth a look.

As mentioned last month, most of the above programs can be ordered from the software mail order companies which advertise in *Electron User*. C&F Associates, 21st Software, Towerhill Computers and Mithras offer many at sale prices.

● *Next month I intend to look in greater depth at the use in the home environment of some of the software I have mentioned.*

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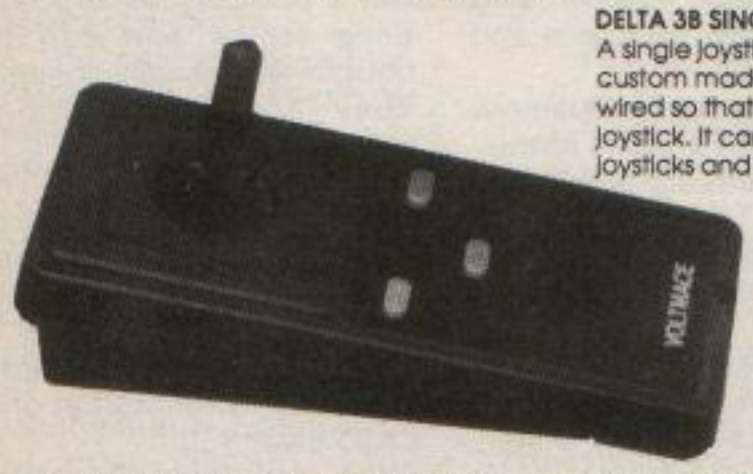

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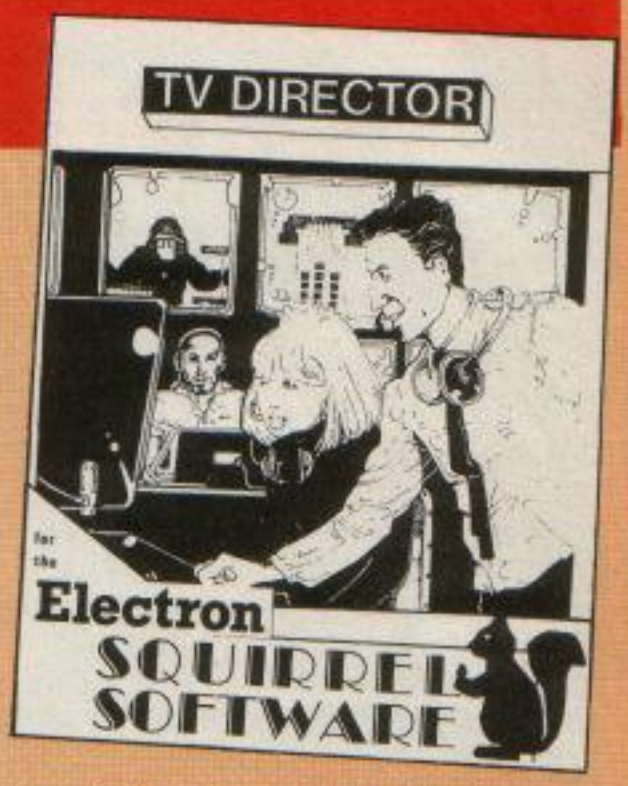


Product: TV Director
Price: £12.95 cassette
Supplier: Squirrel Software, 4 Blindloss Avenue, Eccles, Manchester M30 0DU.
Tel: 061-789 4120

THE tension mounts as you sit at your director's console. You switch the recording light to red and cue the soundtrack.

Before you is a choice of 16 camera shots. Which one should you select for transmission? One moment of indecision and you'll have to call "Cut!" and start again.

That's the excitement offered to you by Squirrel Software with its latest release, TV Director. In fact, you get the chance to design, produce and direct your own videos using nothing more than your trusty computer.

There are, inevitably, a number of limitations so you won't get a top class animated video, but you will experience the thrill and pressure of video work. The possible uses, as the cliché goes, are only limited by your imagination.

The first stage in the video making process is to set the computer aside and plan on paper what you want to do. You can have up to 16 different camera shots which you must then create.

A picture making routine is included within the program for this purpose. At first sight, the graphics will be disappointing. The screen is divided up into a grid of 32 by 24 blocks and one of these blocks is the smallest area that can be defined.

This results in pictures being rather chunky. The reason for this is that the data for an entire picture is stored in just 384 bytes. It is thus possible to store 16 pictures in memory and swap them around with great speed.

A bonus is that pictures can be created quickly. You move a cursor around with keys or joystick and hit the required colour number to set a block. If you can't remember colour numbers, hitting the spacebar will bring up a help page.

This gives details of special effects such as zoom, mirror images, inverting or quartering. All of these can be achieved by single key presses.

The program operates in Mode 5 which allows only four colours. The choice of four includes the full range of flashing colours (which can help with simple animation such as a winking eye) and a range of assorted stripes.

Director works with blocks of frames and normally you would save a block of up to 16 pictures. An option allows the storage of single pictures. This makes it possible for a team of people to work on separate machines, then merge their work into one block.

With the artwork completed, you are ready to move to the studio and produce the video. A display of eight monitors is shown and the other eight pictures are toggled with the spacebar. A central transmission monitor shows the currently selected camera shot.

It's as well to practice first, with the recording light on blue. When you are ready switch to red, cue the sound and you're away. You cut to different cameras by hitting the appropriate camera number. With joysticks or cursor keys it is possible to mix or fade shots.

At this stage you can still use zoom facilities, mirror imagery or quartered shots, giving you a grand total of 64 possible shots to use.

When your sequence is complete, you can save it for future use and move to the preview session. Here you create your credit page then you can see your video in full screen size.

The main problem is synchronising pictures with sound track. The whole program assumes a separate sound source and no use is made of the computer's noises.

It requires a bit of trial and error to know when to start your sequence to match the sound track, but practice makes perfect.

If you can send a signal to a video recorder you'll only need to achieve perfection once since you can replay it all from the video machine.

This can be done from the computer video output (which only gives monochrome) or from the poorer quality UHF socket. The sound system can be connected to the video recorder audio-in socket. Just what leads you will need will depend on the sockets on your video.

The programs are all driven by good clear menus. A sensible choice at each stage is the *command option which allows you to catalogue your cassette.

You can create graphics in picture maker and practice with them in the studio, flit back to picture maker to modify or create new pictures and so on.

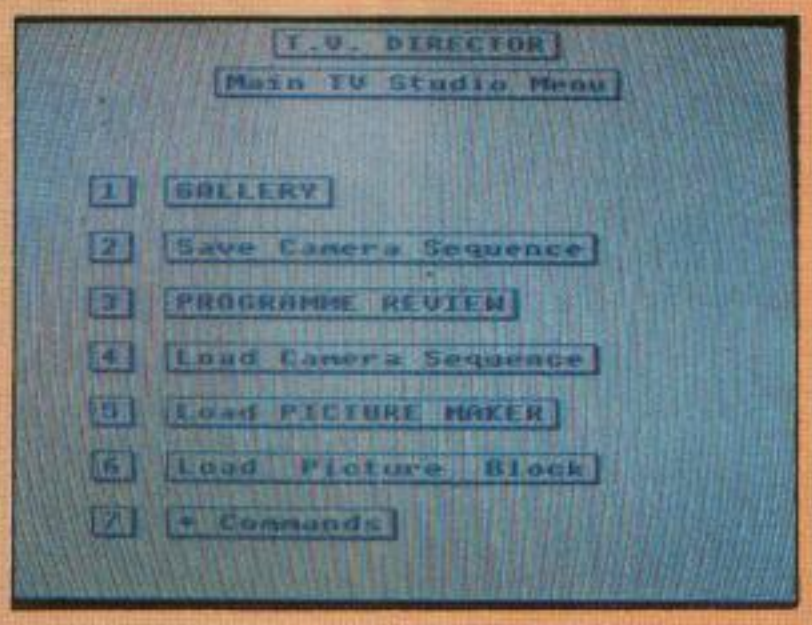
A much more rigorous discipline is needed with cassettes. First create all the graphics, then do all studio work and finally preview and output to video.

One irritating little bug can cause the program to crash if you try to use too many letters in a filename. Otherwise, the whole system is coherently thought out and smoothly put together.

The instruction book is thorough but still makes for easy reading. Squirrel has put together a challenging and enjoyable package which could prove useful to many people.

In particular, schools who have pupils studying Information Technology should look seriously at TV Director, perhaps as an alternative to teletext emulation packages.

Rog Frost



Palace of puzzles

Product: Palace of Magic
Price: £9.95 (cassette), £11.95 (5.25in disc), £14.95 (3.5in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX

PALACE of magic is the latest in a long line of arcade adventures from Superior Software. It's similar in many respects to an earlier release – Citadel.

The scenario is quite simple: You have offended an evil wizard called Caldeti (an anagram of Citadel) and he has turned you into a dwarf and banished you to one of his old homes – The Palace of Magic.

A transporter is your only means of escape. This is hidden somewhere in the palace and grounds which cover a total of 100 screens.

You can move left and right and jump up to twice your height to climb over obstacles. In addition, you can also shin up ropes and climb ladders to reach otherwise inaccessible levels.

Scattered about the palace are lots of coloured bases, some of which have keys, ropes, gold bars and other useful objects standing on them. You can pick up or drop objects while standing on one of these bases and you can carry two at a time.

The keys are letter coded and are used to open similarly coded gates which block your route through the palace. Your task is made a lot harder by the fact that you are not the only living creature – the palace is crammed full of all sorts of unusual and nasty monsters who are out to get you.

If you bump into any of these, you don't die immediately, but they drain your energy and when this reaches zero you perish and the game is over.

The maze is complicated and the puzzles are challenging, but not impossible. Some of the solutions are so obvious once you've discovered them you'll kick yourself for not working them out sooner.

The Mode 5 graphics are quite good and most of the objects look like what they are supposed to be, which is a big help when it comes to figuring out where they should be used.

One or two things are difficult to distinguish and I was stumped by a funny looking blob on the balcony outside the church – it turned out to be a Bishop.

There isn't a lot of sound in the game, but then it doesn't require much and I didn't miss it. The only real criticism I can make is that it doesn't have a save game facility.

I have to admit to being an avid arcade adventure fan. I haven't yet fathomed all the mysteries of Citadel and I know there are a lot of people in the same boat.

Now with Palace of Magic to escape from as well, I forsee many more late nights of problem solving for a lot of adventurers.

Desmomd

Sound	5
Graphics	9
Playability	9
Value for money	9
Overall	9

Soap opera

Program: Suds
Price: £4.00
Supplier: Riverdale Software, 95 Printon Avenue, Manchester M9 3JW.
Tel: 061-795 4549

TELEVISION, these days seems congested with soap operas. Whether it is a simple British offering in the mould of Eastenders, a dire Australian attempt like Sons and Daughters or an elaborate American extravaganza such as Dynasty, whenever we switch on, it is the continuing story of such and such.

I suppose it was only a matter of time before these everyday lives found their way into computer adventures. Suds is unashamedly a direct spoof on the four major British soaps – Emmerdale Farm, Coronation Street, Cross-Roads and Eastenders – but the names have been changed to protect the innocent.

The adventure loads in four parts, though you don't need to complete each one in order to progress to the next. However, each section is undoubtedly more difficult than its predecessor.

You are required to negotiate the puzzles of Emeroyd Farm then catch a train to the mean streets of Manchester and the perils of Abdication Street.

If you successfully overcome the traps of the TV studio, the Cross-Eyes motel looms where the mad arsonist awaits you.

Finally, if you haven't lost your sanity, who knows what the fabled land of the Dead Enders has in store for you.

I have now completed the Emeroyd Farm section and have made major inroads into the three other parts of this mega-game, and life is becoming complex beyond imagination – after all, isn't that what soap operas are all about?

The puzzles in part one, although logical in retrospect, are ingenious and riddled with superb puns.

For instance, upon climbing a tree I discovered a herring which I duly smoked over a war women's camp fire. Hey presto, I had a red herring. However, this has a particular use which I will leave you to discover.

Later in the adventure I had to pour a bucket of cement over some relatives who were blocking my path to the next section. Of course, the result was to cement relations.

The Black-Pudding bomb in Abdication street is something else and I don't think Equity would be too pleased to discover its purpose.

A skeleton will provide a key to succeeding at the Motel, where the problems have had me scratching my head for nights on end. Meanwhile the Dead Enders have quite a few surprises awaiting even the most experienced of adventurers.

This is a truly addictive adventure which requires as much thinking and planning as key tapping. The humour is refreshing and something in the mould of What's Eeyore's? or Locks of Luck.

American Suds is now in production with an Australian version to follow. In the meantime, I suggest you go out and buy Suds immediately.

Pendragon

Presentation	7
Atmosphere	8
Frustration Factor	9
Value for Money	10
Overall	8

Superb compilation

Program: Power Pack II
Price: £9.95
Supplier: Audiogenic, PO Box 88, Reading, Berkshire RG7 4AA.
Tel: 0734 303663

THE passion for resurrecting old games continues unabated, this time with a compilation from Audiogenic. It is, however, good to see that not all of the bundled titles are re-released oldies: Two of the games are making their first appearance.

The first of these is Saracoid, a superb shoot-'em-up. The sprites are large and colourful, the controls simple and the action smooth and fast.

One point that impressed me is it gets off to such an easy start. So many shoot-'em-ups start hard and just get harder – it's a pleasant change to find one that anyone can play. In all, I cannot fault Saracoid in any way – buy Power Pack II for this game alone.

The other newcomer is Froot Raid, a fruit machine simulation. I have seen many such programs over the years, but none has really captured the atmosphere of the real thing, simply because there isn't a genuine element of risk.

While this implementation has probably the most comprehensive range of features I've yet seen, it too fails to convey the feel of a real one-armed bandit. Although it represents a technically excellent attempt at computerising an obviously uncooperative subject, without the aspect of real money it doesn't work for me.

Stix is a fast-moving stream of energy darting round the screen in a random fashion. You must fill in areas

of the screen in order to trap Stix, but go carefully: One touch is fatal. You can choose either fast or slow fill. Slow gives you a much larger bonus, but is considerably more dangerous.

To make matters worse lethal blobs home in on you from all sides, making the game quite frantic. One maddening problem is the playing keys are located so closely together it is virtually impossible to play the game with any degree of smooth control. Worse still, you cannot choose your own keys.

This unnecessary flaw unfortunately detracts greatly from what is actually quite an enjoyable game.

Psycastria is an immensely – and deservedly – successful shoot-'em-up featuring the smoothest scrolling ever seen on the Electron. When you flip your ship left and right, the screen scrolls around you.

Although the Electron version is not quite as fast as the one for the BBC Micro, you do at least stand a chance of seeing what's about to hit you. Psycastria follows the great idea of "even if it doesn't move, shoot it anyway".

In spite of what the inlay would have you believe, there doesn't seem to be any particular mission – it's really just kill, kill kill.

The game features some wonderful special effects, including music, multi-player option and a demonstration mode. The only point I found annoying is that you must clear each level in one go, without losing a life.

This niggle aside, Psycastria is certainly an impressive piece of programming which has lost none of its addictiveness.

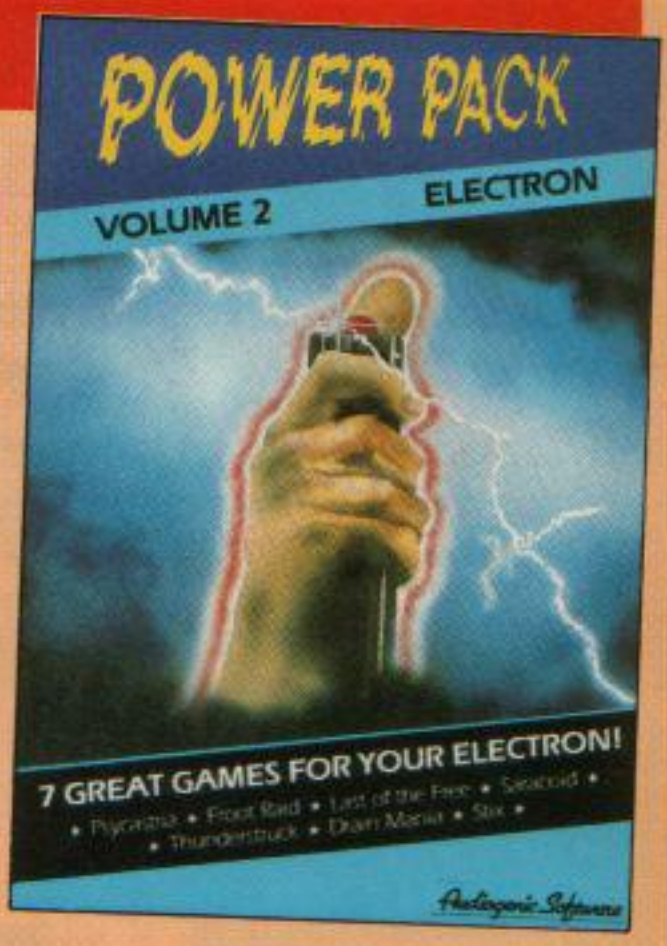
Drain Mania is a fairly standard platform game set in a sewer, of all places. This is, unfortunately, far from deserted: It's populated with a variety of deadly creatures out to do you no good at all.

Luckily they can be killed by a head-butt from below, followed by a swift kick. This can be somewhat hairy, since the platforms are very slippery. As you kill one beastie you will often find yourself sliding helplessly into the jaws of another.

There is recompense, as over the years many coins have been lost down the drains – yours to keep if you can grab them. Although Drain Mania is a game I have played on and off for years, I feel most modern game players would find it too elementary to hold their interest for long.

The last two games in the package come from the hand of talented programmer Peter Scott. Both are multi-screen arcade-adventures featuring brightly coloured graphics, lots of objects and mind bending puzzles.

Last of the Free is essentially a combination of a platform game such as



Hunkidory, another Scott offering, and an adventure game. You may run and jump around a number of screens avoiding a variety of moving objects, only to find your way blocked by a door. To open it you must find the correct key.

There are many objects to help you on your way, but use them wisely as they can only be used once. Solving the game requires careful manipulation and time, but tread carefully and you will eventually be free.

Thunderstruck introduces Spreco, a cute little character who has since featured in a number of Peter's more recent releases.

A freak accident has trapped you in a medieval castle with a number of other robots, none of which is proving very friendly.

Thunderstruck is more complex than Last of the Free and also far more of an adventure game, since your escape can only be engineered by bartering with the castle's other inhabitants. This frequently involves solving complex adventure-style chaining puzzles.

As with its predecessor, to complete the game you must give the right object to the right character – once again you only get one chance with each object. A better game with better graphics.

Power Pack II represents many hours of great fun with something to appeal to everyone. Great value.

Martin Reed

Sound	8
Graphics	8
Playability	9
Value for money	9
Overall	9

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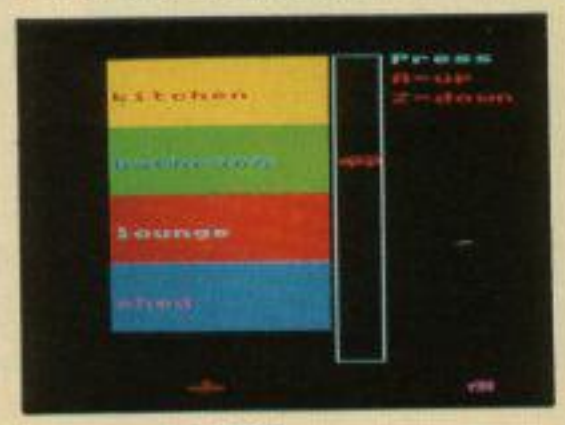

ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 53

A joyful utility

Roland Waddilove shows how to add a Plus 1 joystick option to arcade games

HOW many times have you been frustrated by the lack of a joystick option in your favourite game? And how many keyboards have you hammered into submission? The answer to both these questions is likely to be, "Quite often".

Not only is it often easier to play with a joystick, but it also saves the keyboard from being constantly bashed as you try to zap the zombies or save the Earth from destruction yet again.

Unfortunately because the Electron doesn't come with a built-in joystick port, many programmers don't include an option in the game. So you're restricted to keyboard whether you like it or not.

With the utility presented here, however, you can now plug your joystick into your Plus 1 and use it with many of your favourite games. I must stress that it won't work with all software, and you'll need to experiment a little with the games you've got.

The first thing to do is type in and save the utility. Before running a game, load and run the joystick converter. You'll be asked to press the keys used in the game for up, down, left, right and fire.

Not all games use all five options. In these cases, choose any old key for the options not needed, they won't be used.

Next enter the address to store the machine code. You need to choose a safe area of ram here, otherwise you're quite likely to crash the micro – it won't do any harm, but you'll have to switch off for a second or two.

If you're not sure where to store the code, simply press Return without entering anything and the program will decide for you. Having done this, the routine is primed. Don't press Break or you'll disable it.

Now load and run the game you wish to play, and instead of using the keyboard use the joystick. Note that some options may still need to be selected from the keyboard.

The program works by intercepting the main osbyte vector and redirecting it to a short piece of machine code. This checks whether the game being run is trying to read the keyboard using INKEY(-n).

If it is, it looks at the key number in the X register to see if it's one you selected. If so, it reads the joystick instead, otherwise it passes on the osbyte call to the operating system which handles it as normal.

If the game doesn't use INKEY(-n) the keyboard will be read as normal and the joystick will be ignored.

When tested, the routine worked with most magazine listings and even some commercial software – Superior Software/Acornsoft's Planetoid for instance.

So get your games out and start experimenting. Let us know which software it works with. ■

```
   10 REM Keyboard->Joystick
   20 REM By R.A.Waddilove
   30 REM (c) Electron User
   40 MODE 6
   50 *KEY10 OLD|MRUN|M
   60 IF ?&20B<&80 CALL!-4
   70 PRINT"Keyboard to Joy
stick Converter"
   80 L%=FNkey("LEFT")
   90 R%=FNkey("RIGHT")
  100 U%=FNkey("UP")
  110 D%=FNkey("DOWN")
  120 F%=FNkey("FIRE")
  130 PRINT"Where shall I s
tore the code?"
  140 PRINT"(Hit RETURN if y
ou're not sure)":*FX21
  150 INPUT "Address=&"a$
  160 IF a$="" a=&110 ELSE a
=EVAL("&"+a$)
  170 vector=&20A
  180 FOR i=0 TO 2 STEP 2
  190 P%=a
  200 [OPT i
  210 SEI
  220 LDA vector
  230 STA osbyte+1
  240 LDA vector+1
  250 STA osbyte+2
  260 LDA #joystick MOD 256
  270 STA vector
  280 LDA #joystick DIV 256
  290 STA vector+1
  300 CLI
  310 RTS
  320
  330 .joystick
  340 CMP #&81
  350 BNE osbyte \INKEY?
  360 CPY #&FF
  370 BNE osbyte \INKEY(-n)?
  380 TXA:PHA:TYA:PHA
  390 LDA #&80
  400 CPX #256-F%
  410 BNE left
  420 .fire
  430 LDX #0
  440 JSR osbyte
  450 TXA:AND #&3
  460 BNE pressed
  470 .not_pressed
  480 LDX #0
  490 LDY #0
  500 BEQ here
  510 .pressed
  520 LDX #&FF
  530 LDY #&FF
  540 .here
  550 PLA:PLA
  560 RTS
  570
  580 .left
  590 CPX #256-L%
  600 BNE right
  610 LDX #1
  620 .read1
  630 JSR osbyte
  640 CPY #200
  650 BCS pressed
  660 BCC not_pressed
  670
  680 .right
  690 CPX #256-R%
  700 BNE up
  710 LDX #1
  720 .read2
  730 JSR osbyte
  740 CPY #32
  750 BCC pressed
  760 BCS not_pressed
  770
  780 .up
  790 CPX #256-U%
  800 BNE down
  810 LDX #2
  820 BNE read1
  830
  840 .down
  850 CPX #256-D%
  860 BNE exit
  870 LDX #2
  880 BNE read2
  890
  900 .exit
  910 PLA:TAY:PLA:TAX
  920 LDA #&81
  930 .osbyte
  940 JMP 0
  950 ]
  960 NEXT
  970 CALL a
  980 CLS
  990 PRINT"Now load and ru
n the game,"
 1000 PRINT"BREAK disables
the routine."
 1010 END
 1020
 1030 DEF FNkey(a$)
 1040 PRINT"Hold down the "
a$" key:";
 1050 K%=0
 1060 K%=K%+1:IF K%=127 K%=1
 1070 IF INKEY-K% ELSE 1060
 1080 PRINT"ok"CHR$7:*FX21
 1090 IF INKEY-K% GOTO 1090
 1100 =K%
```

electron user
ARCADE CORNER
Compiled by MARTIN REED

MANY thanks to Daniel and Gemma Ellis from Bath, Avon, P. Hacker from Solihull, West Midlands, David Donaldson from Amersham, Bucks, Matthew O'Donnell from Reading, Berks, Rajan Shori from Lee Green, London and M. Eastmond from Amersham, Bucks for the selection of pokes, tips and cheat modes featured this month. Keep 'em coming!

Share your hints, tips, peeks and pokes with fellow *Electron User* arcade addicts, but please ensure they are all your own work. Send them to:

Arcade corner
Electron User
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Stockport
SK7 5NY

***Hunkidory** – Bug-Byte*

The inlay card mentions that pressing Control+C does strange things. This key combination actually activates a level-jump, allowing immediate access to any of the game's 20 screens.

After the game has loaded, press S for sound or Q for quiet then Control+C. Keys 0 to 9 will start you on levels 1 to 10 and keys Q to P (the keyboard row underneath the number keys) select levels 11 to 20.

The game immediately starts on the level selected. When that game has ended simply repeat the process and select the level again.

***Escape from Moonbase Alpha** – Micro Power*

Load the game as normal then get yourself killed – not too difficult a task. Answer N to the prompt "Another game?" then LIST 700.

The variables *S%*, *G%* and *P%* stand for the initial values of your strength, gold and hulk pills respectively.

Change these to whatever you want, then simply type RUN to restart the game with these new values.

***Blagger** – Alligata*

To equip yourself with infinite lives, enter the following lines:

```
*LOAD EBLAG2 900
*LOAD EBLAG3 1900
*LOAD EBLAG4 1068
*LOAD EBLAG5 400
*LOAD EBLAG6 2A00
*LOAD EBLAG7 E00
```

then enter the pokes themselves:

```
?&2913=&EA
?&2914=&EA
?&2916=&EA
```

followed by CALL &1900 to start the game.

***Vegas Jackpot** – Mastertronic*

When you are given the option of collecting your winnings or gambling, press the Shift+Control keys together. If you now gamble you will always win.

Killer Gorilla – Micro Power

Type in the following program and save it to tape as "KG-MOD".

```
  10 *LOAD GORILLA 3000
  20 *LOAD GORILLA2
  30 ?&3404=&30
  40 ?&340A=&31
  50 ?&3410=&32
  60 ?&3416=&33
  70 !&341D=&002B6F4C
  80 $&1021="David Donald
son":?&10A2=&07:?&10AA=&09
:?&10B2=&00
  90 MODE 4:PRINT TAB(2,9
);"Normal(Y/N)? ";:*FX15
 100 G%=GET:IF G%<>78 THE
N PRINT"Yes":S%=1:T%=0:GOT
O 220
 110 PRINT "No""  Pleas
e type the level no.(1-3):
 ";
 120 G%=GET:IF G%<49 OR G
%>51 THEN G%=49
 130 VDU G%:S%=G%-48:REM
start level no.
 140 PRINT""  Please typ
e the screen no.(1-4): ";
 150 G%=GET:IF G%<49 OR G
%>52 THEN G%=49
 160 VDU G%:T%=G%-49:REM
start screen no.
 170 PRINT"" Do you want
 infinite lives(Y/N)? ";
 180 G%=GET:IF G%<>89 THE
N PRINT"No" ELSE PRINT"Yes
":L%=2:!&1E44=&031001A9:GO
TO 220:REM infinite lives
 190 PRINT"Please type t
he no. of lives(1-255): ";
 200 INPUT"A$:IF VAL(A$)
<1 OR VAL(A$)>255 THEN VDU
31,37,17,51,10:A$="3"
 210 PRINT TAB(37,17);A$:
?&110F=VAL(A$):REM no. of
lives
 220 FOR I%=0 TO 2 STEP 2
:P%=&1112:[OPT I%
 230 JSR &120:NOP:NOP:NOP
:NOP
 240 ]:P%=&120:[OPT I%
 250 LDX# S%:STX &67:LDX#
 T%:STX &25:LDX# 0:RTS
 260 ]:NEXT
 270 MODE 5:VDU 28,2,29,1
6,25,12:CALL &3400
```

To start:

```
CHAIN "KILLER"
```

then press Escape after the title page comes up. Type:

```
PAGE=&3900
CHAIN "KG-MOD"
```

then reload KG-MOD from your own cassette. After KG-MOD has loaded replace the Killer Gorilla cassette in the recorder and press PLAY.

When the GORILLA and GORILLA2 files have loaded you will be asked which level you wish to start on, whether you want extra lives and so forth. After selecting these the game will start.

Mr Wiz – Superior Software

When playing the game hold down Space+Escape to jump to the next screen.

Swoop – Micro Power

To obtain infinite lives enter:

```
CHAIN"SWOOP"
```

then press Break when it has loaded. This defines the envelopes. Now type:

```
*LOAD PICTURE
*LOAD MEMORY
*LOAD GAME
```

and enter the following pokes:

```
?&1B47=&EA
?&1B48=&EA
```

Finally CALL &1900 to start the game.

Mousetrap – Tynesoft

The following poke gives up to 45 lives in Mousetrap. To start:

```
LOAD "MOUSE"
```

then enter:
150 *LOAD TRAP
and type RUN. When the game has finished loading and the BASIC prompt has reappeared, type:

```
?&18D8=x
```

where *x* is the number of lives. Do not select more than 45 otherwise the screen display will be corrupted. Finally CALL &1100 to start the game.

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	3,3 Rooftop Idol	2,3 Rooftop Top hat					3,3 East Tower
	3,2 West Palace	2,2 Rooftop	1,2 Rooftop	0,2 Rooftop Top hat	1,2 Rooftop Key A	2,2 Rooftop Key B	3,2 East Tower Hole in wall
4,1 Tower Base Top hat	3,1 West Palace	2,1 West Palace	1,1 Main Palace	0,1 Main Palace	1,1 East Palace Gate H	2,1 East Palace Boot	3,1 Tower Base
4,0 Tower Base Gate B	3,0 West Palace Cross	2,0 West Palace Gate E	1,0 Main Palace Key F	0,0 Main Palace Start position	1,0 East Palace Top hat	2,0 East palace	3,0 Tower Base Top hat
4,1 West Exit Key H	3,1 Passages Rope	2,1 Passages Candle	1,1 Passages	0,1 Passages	1,1 Passages Gold Bar	2,1 East Exit	3,1 East Exit
4,2 West Exit	3,2 Passages	2,2 Passages	1,2 Passages Top hat	0,2 Passages Gate A		2,2 Basement Gate O	3,2 Basement

Map locations in the palace, showing objects and gates

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THE GUNPOWDER PLOT

Help Guy Fawkes escape the pursuing Beefeaters in ANTHONY HOUGHTON's exciting arcade game

IN the year 1605, a young Briton by the name of Guy Fawkes, tunnelled into a cellar below the Houses of Parliament and filled it with barrels of gunpowder.

His plan was to sneak into the building unnoticed on November the fifth at the opening of Parliament when the King, Lords and Commons were all assembled. He then planned to set light to the fuse and make his escape before the gunpowder exploded, blowing up the whole house and bringing proceedings to an abrupt end.

Unfortunately for Guy and his fellow conspirators, the plot was discovered on the previous day. The Beefeaters caught them and they were all executed as traitors in January of 1606. Henceforth, their conspiracy became known as the Gunpowder Plot.

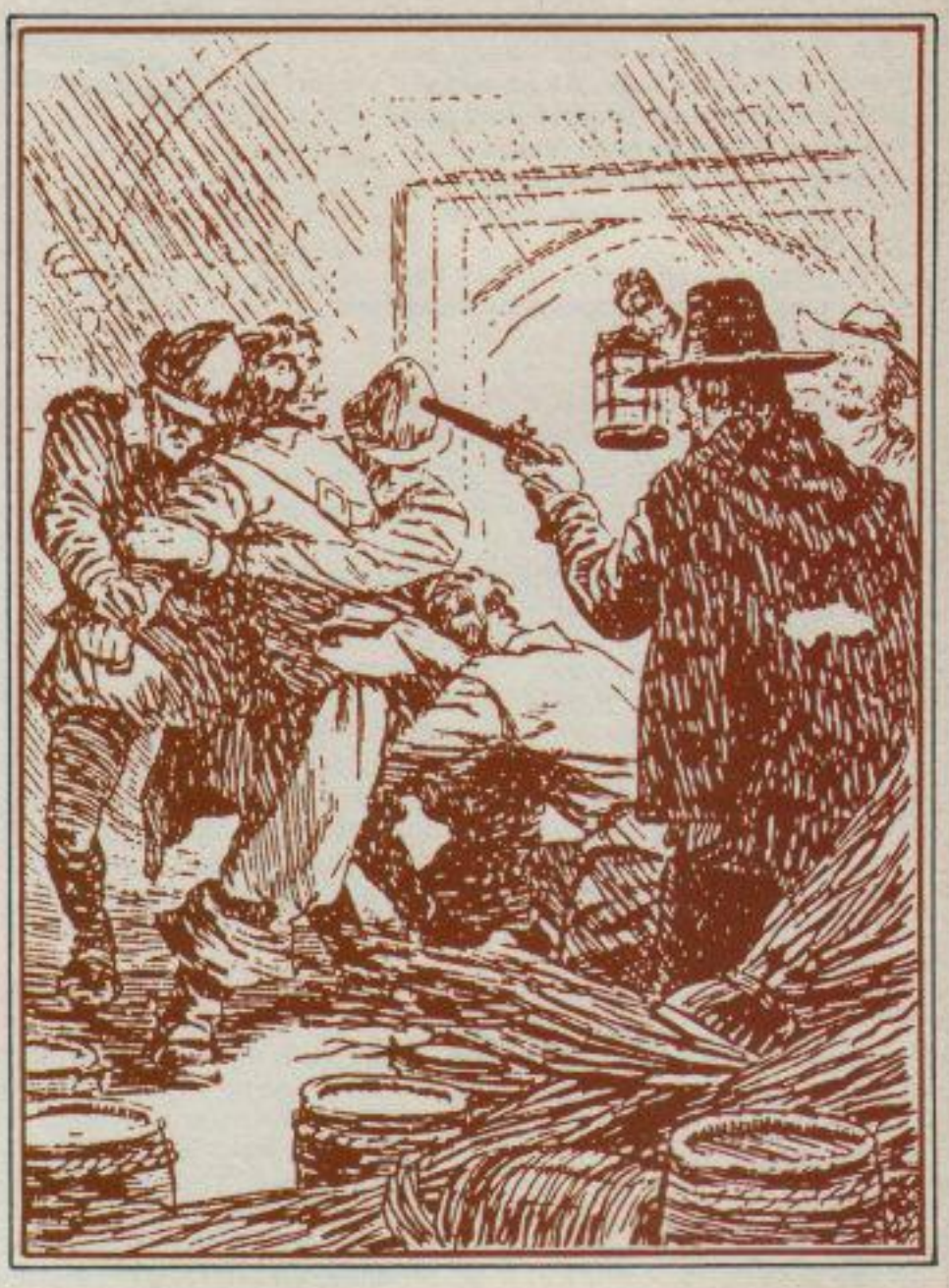
Now, in this superb machine code arcade game, you can take on the role of Guy Fawkes as he tries to outrun the Beefeaters intent on his capture. His only chance of escape is to lure his foes into the barrels of gunpowder left in the cellar and blow them up.

Can you change the course of history and help him make good his escape? Only you will know when you play Fawkes' Run.

When each level has been completed the next appears with more Beefeaters, faster movement and one extra life awarded, up to a maximum of nine.

When typing in the game you should note that the Escape key is disabled at line 40. This line should be omitted until your typing has been completely debugged. Also, the function key buffer has been used for workspace by the machine code, so any *KEY definitions stored there will be erased.

If the program is rerun after pressing Escape, it may hang due to the redirection of the event vector in the machine code. This can be avoided by using Break to halt the program instead. ■



VARIABLES

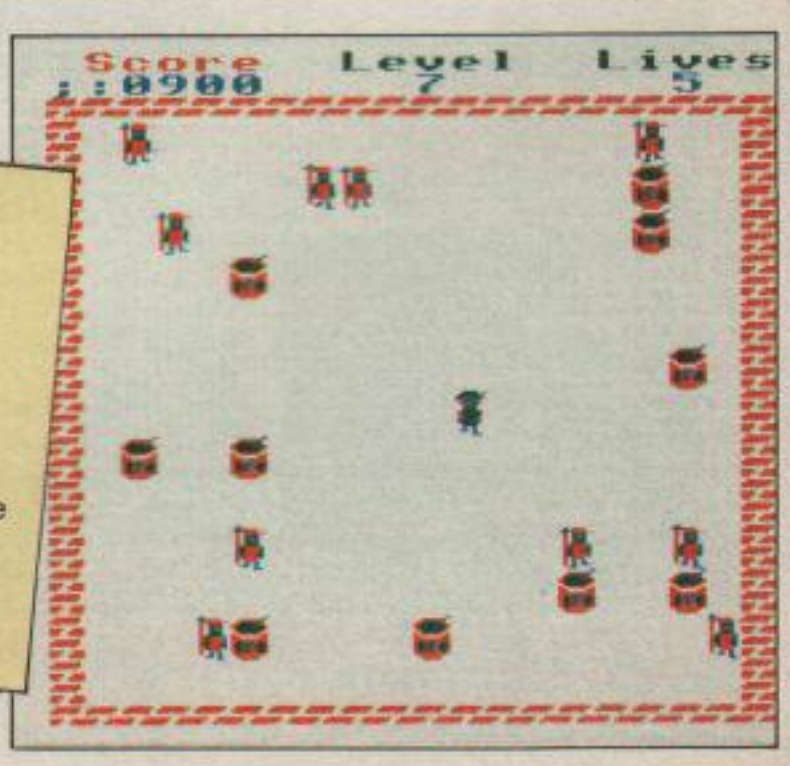
lives	Number of men remaining.
level	Current level of play.
speed	Speed of game.
beefs	Number of Beefeaters.
sprite	Start of sprite routine.

PROCEDURES

assem	Assemble the machine code.
init	Initialise the game.
kill	Deal with Fawkes' capture.
game	Play the game.
instruct	Display the title screen.

CONTROLS

Z	Right
X	Left
*	Up
?	Down
S	Sound on
Q	Sound off
Copy	Pause the game
Delete	Restart a paused game
Escape	Quit the current game



Turn to Page 35 ►

More great Electron games

This month we introduce a new volume in our Ten of the Best series – 10 more games to give you many hours of fun and entertainment.

These four packages are crammed with the best games from the last two years of Electron User. As an added bonus a previously unpublished game has been added to each one – stunning machine code masterpieces from our technical wizard, Roland Waddilove.

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Volume 2

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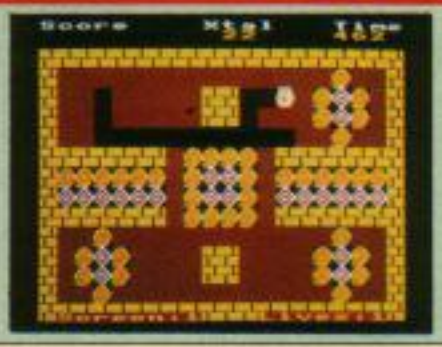

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Grebit: *Guide the frog across the busy road then across the fast-flowing river!*
Fruit Worm: *Steer the worm towards the fruit while avoiding rocks and its ever-growing tail.*
Manic Mole: *Watch out for melting platforms and conveyor belts in your quest for jewels.*
Skramble: *Fly your fighter fast and low over the landscape to penetrate enemy territory.*
Mr. Freeze: *You'll need speed and strategy to reach the ice blocks before they melt away.*
Paint Roller: *Steer a speeding roller, run over paint pots but keep clear of the rocks.*

Volume 4

NEW

Lunar Invasion: *Defend the moon from wave after wave of marauding aliens in this superb multi-screen arcade game.*
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Oxo: *High strategy meets low cunning in a logic game to strain your brain.*
Missile Attack *Defend your city from a missile invasion and save it from certain doom.*

TO ORDER TURN TO THE FORM ON PAGE 53

Gunpowder Plot listing

◀ From Page 33

```
   10 REM Fawkes Run
   20 REM By A.Houghton
   30 REM (c) Electron User
   40 *FX229,1
   50 MODE6:PROCassem:REPEAT
MODE5:PROCinstruct:PROCwait
   60 REPEAT:MODE5
   70 PROCinit:PROCscreen
   80 PROCgame
   90 IF?flag=27UNTIL1:UNTIL
0
  100 COLOUR3:PRINTTAB(5,31)
"GAME OVER";
  110 TIME=0:REPEATUNTILTIME
>200:CLS:COLOUR1:PRINTTAB(1,
5)"You scored ";:COLOUR2:CAL
Lpnat:COLOUR1:PRINT"TAB(3)"
on level ";:COLOUR2:PRINT;le
vel
  120 GCOL0,3:MOVE0,500:PLOT
21,1280,500
  130 PROCwait
  140 UNTIL0
  150 DEFPROCgame:REPEAT:PRO
Cinitg:CALLmain:IF?flag=1PRO
Ckill ELSEIF?flag=2PROCclear
ed ELSEUNTIL1:ENDPROC
  160 UNTILlives=0:ENDPROC
  170 DEFPROCkill:!&70=!gadr
:CALLprint:!&70=!gadr:CALLst
ore:VDU17,2,31,(?gx)+1,(?gy)
*2+4,225,8,10,226
  180 FORN%=200TO100STEP-10:
SOUND1,1,N%,1:NEXT:lives=liv
es-1:TIME=0:REPEATUNTILTIME>
100
  190 IFlives !&70=!gadr:stl
p2?1=&72:stlp2?3=&70:CALLsto
re:stlp2?1=&70:stlp2?3=&72
  200 PROClives:ENDPROC
  210 DEFPROCcleared
  220 bonus=100*level:COLOUR
3:PRINTTAB(2,31)"Bonus:";:CO
LOUR2:PRINT;bonus;:FORN%=bon
us DIV10TO1STEP-1
  230 bonus=bonus-10:COLOUR2
:PRINTTAB(8,31);bonus" ";:CA
LLinsc:SOUND0,-15,6,1:TIME=0
:REPEATUNTILTIME>2:NEXT
  240 REPEATUNTILTIME>100
  250 level=level+1:IF?bfs<3
2 ?bfs=?bfs+1
  260 IF?speed<255 ?speed=?s
peed+1
  270 IFlives<9lives=lives+1
  280 CLS:PROCscreen:ENDPROC
  290 DEFPROCscreen:COLOUR1:
PRINTTAB(0,3)STRING$(20,CHR$
224):FORN%=4TO29:VDU31,0,N%,
224,31,19,N%,224:NEXT:PRINTT
AB(0,30)STRING$(20,CHR$224);
:PRINTTAB(1,1)"Score":COLOUR
3:PRINTTAB(8,1)"Level"TAB(15
,1)"Lives"
  300 COLOUR2:CALLpscore:PRO
Clevel:PROClives:FORN%=0TO25
0STEP4:N%!&800=0:NEXT
  310 FORN%=1TO10:REPEAT:X%=
RND(16):Y%=RND(11):A%=X%+18*
Y%:UNTILX%<>10ANDY%<>6ANDA%?
&800=0:A%?&800=1:CALLcalcadr
:!&70=!&80:!&72=&A40:CALLpri
nt:NEXT
  320 FORN%=1TO?bfs:REPEAT:X
%=RND(18)-1:Y%=RND(13)-1:A%=
X%+18*Y%:UNTILX%<>10ANDY%<>6
ANDA%?&800=0:?FNfma(0)=X%:?F
Nfma(1)=Y%:?FNfma(2)=A%:?FNf
ma(3)=(N%MOD2)*&40+(RND(2)-1
)*&20
  330 CALLcalcadr:?((N%-1)*2
+&CC0)=?&80:?((N%-1)*2+&CC1)
=?&81:!&70=!&80:!&72=&A00+((
?FNfma(3))AND&20):CALLprint:
A%!&800=2:NEXT
  340 ?monlk=0:?monlk2=0:?mo
ns2=?bfs:ENDPROC
  350 DEFPROCinitg:PROCgetpo
s:?gx=X%:?gy=Y%:?gpos=X%+18*
Y%:CALLcalcadr:!&70=!&80:?ga
dr=?&80:gadr?1=?&81:!&72=&9C
0:?gdat=&C0:?facing=&C0:?ste
p=0:CALLprint
  360 COLOUR3:PRINTTAB(7,31)
"READY!";:FORN=1TO1000:NEXT:
PRINTTAB(7,31)"       ";:COLO
UR2:ENDPROC
  370 DEFPROCgetpos:IF?&B76=
0X%=10:Y%=6:ENDPROC ELSEREPE
AT:X%=RND(4)+7:Y%=RND(4)+3:A
%=X%+Y%*18:UNTILA%?&800=0:EN
DPROC
  380 DEFPROClevel:PRINTTAB(
9,2)RIGHT$("  "+STR$level,2)
:ENDPROC
  390 DEFPROClives:PRINTTAB(
16,2)RIGHT$("  "+STR$lives,2
):ENDPROC
  400 DEFFNfma(n%)=(N%-1)*4+
&C20+n%
```

This is one of hundreds of programs now available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs will also run on the Electron.

```
  410 DEFPROCinit:VDU23;8202
;0;0;0;19,3,4;0;:lives=5:?sc
ore=0:score?1=0:score?2=0:le
vel=1:?bfs=4:?speed=242:ENDP
ROC
  420 DEFPROCassem:a=&8E:b=&
80:c=&70:d=&72:RESTORE1140:F
ORN%=&900TO&A5FSTEP4:READ!N%
:NEXT
  430 VDU23,224,126,254,252,
0,231,239,207,0:VDU23,225,56
,124,124,254,214,214,254,124
:VDU23,226,108,40,56,130,108
,16,108,130
  440 ENVELOPE4,1,3,2,-2,6,6
,6,100,0,0,-5,100,0:ENVELOPE
1,129,-15,-8,-3,10,10,10,126
,0,0,-126,126,126
  450 DIMQ%4000:IFINKEY-256=
1timer=&29F ELSEtimer=&2A0
  460 FORP=0TO2STEP2:P%=Q%:[
OPTP
  470 .sprite JSRprint:LDA&7
4:STAc:LDA&75:STA&71:LDA&76:
STAd:LDA&77:STA&73
  480 .print LDX:2:.plp1 LDY
:15:.plp2 LDA(d),Y:EOR(c),Y:
STA(c),Y:DEY:BPLplp2
  490 LDAc:CLC:ADC:&40:STAc:
LDA&71:ADC:1:STA&71:LDAd:ADC
:16:STAd:DEX:BNEplp1:RTS
  500 .store LDA:&E0:STAd:LD
A:&A:STA&73:LDX:2:.stlp1 LDY
:15:.stlp2 LDA(c),Y:STA(d),Y
:DEY:BPLstlp2
  510 LDAc:CLC:ADC:&40:STAc:
LDA&71:ADC:1:STA&71:LDAd:ADC
:16:STAd:DEX:BNEstlp1:RTS
  520 .calcadr INX:STX&88:TY
A:CLC:ADC:2:JSRmult280:LDA&8
8:JSRmult10:CLC:LDAb:ADC&82:
STAb:LDA&81:ADC&83:ADC:&58:S
TA&81:RTS
  530 .mult280 ASL A:TAX:LDA
 &C36D,X:STA &81:LDA &C36E,X
:STA b:RTS
  540 .mult10 LDX:0:STX&83:S
TA&82:LDX:4:.mlp2 ASL&82:ROL
&83:DEX:BNEmlp2:RTS
  550 .gadr EQUW0:.gdat EQUW
&900
  560 .gpos EQUB0:.gdir EQUB
0:.gx EQUB0:.gy EQUB0:.step
EQUB0:.facing EQUB0
  570 .keys LDA:0:STAgdir:LD
A:129:LDX:&B7:LDY:&FF:JSR&FF
F4:TYA:BEQnotup:LDAgy:BEQnot
up:LDA:&EE:STAgdir:DECgy
  580 .notup LDA:129:LDX:&97
:LDY:&FF:JSR&FFF4:TYA:BEQnot
do:LDAgy:CMP:12:BEQnotdo:LDA
:18:CLC:ADCgdir:STAgdir:INCg
y
  590 .notdo LDA:129:LDX:&9E
:LDY:&FF:JSR&FFF4:TYA:BEQnot
le:LDAgx:BEQnotle:LDA:&FF:CL
C:ADCgdir:STAgdir:DECgx
  600 .notle LDA:129:LDX:&BD
:LDY:&FF:JSR&FFF4:TYA:BEQnot
ri:LDAgx:CMP:17:BEQnotri:LDA
:1:CLC:ADCgdir:STAgdir:INCgx
  610 .notri LDAgdir:BNEnewp
os:RTS:.newpos LDAstep:EOR:&
20:STAstep:LDAgpos:CLC:ADCgd
ir:STAgpos:LDAgdir:CMP:&EE:B
NEnup:LDA:b:STAfacing:JMPclo
s
  620 .nup CMP:18:BNEndo:LDA
:&C0:STAfacing:JMPclos:.ndo
CMP:&FF:BEQle:CMP:17:BEQle:C
MP:&ED:BNEnle:.le LDA:0:STAf
acing:JMPclos:.nle LDA:&40:S
TAfacing
  630 .clos LDY:0:.oslp LDAo
stab,Y:CMPgdir:BEQfndos:INY:
INY:INY:JMPoslp:.fndos LDAos
tab+1,Y:STAoffset:LDAostab+2
,Y:STAoffset+1:.rts1 RTS
  640 .ostab EQUB&ED:EQUW&FE
B8:EQUB&EE:EQUW&FEC0:EQUB&EF
:EQUW&FEC8:EQUB&FF:EQUW&FFF8
:EQUB1:EQUW8:EQUB17:EQUW&138
:EQUB18:EQUW&140:EQUB19:EQUW
&148
  650 .offset EQUW0
  660 .mvg LDAgdir:BEQrts1:L
DAgadr:STAc:LDAgadr+1:STA&71
:LDAgadr:CLC:ADCoffset:STAga
dr:STA&74:LDAgadr+1:ADCoffse
t+1:STA&75:STAgadr+1
  670 .prg LDAgdat:STAd:LDA:
9:STA&73:LDA:0:CLC:ADCstep:A
DCfacing:STAgdat:STA&76:LDA:
9:STA&77:JMPsprite
  680 .speed EQUB242
  690 .esc LDA:27:STAflag:RT
S:.flag EQUB0
  700 .main LDAspeed:STAtime
r:LDA:0:STAflag
  710 .mainloop LDA:129:LDX:
&8F:LDY:&FF:JSR&FFF4:TYA:BNE
esc:LDA:129:LDX:&96:LDY:&FF:
JSR&FFF4:TYA:BNEpause
  720 JSRkeys:JSRmvg:JSRctrl
mons:JSRmvmons
  730 JSRwait
  740 JSRmvg:LDAmonlk:EOR:&2
0:STAmonlk:JSRmvmons
  750 LDAflag:BNEnomons:LDYg
pos:LDA&B00,Y:CMP:2:BEQdead:
CMP:1:BEQdead
  760 JSRwait:JMPmainloop
  770 .dead LDA:1:STAflag:.n
omons RTS
  780 .pause LDA:129:LDX:&A6
:LDY:&FF:JSR&FFF4:TYA:BEQpau
se:LDAspeed:STAtimer:JMPmain
loop
  790 .wait BITtimer:BMIwait
:LDAspeed:STAtimer:LDA:19:JM
P &FFF4
  800 .score EQUD0
  810 .pscore LDA:31:JSR&FFE
E:LDA:0:JSR&FFEE:LDA:2:JSR&F
FEE:.pnat LDAscore:JSRdigit:
LDAscore+1:JSRdigit:LDAscore
+2
  820 .digit TAX:LSRA:LSRA:L
SRA:LSRA:JSRasci:TXA:AND:&F:
.asci CLC:ADC:&30:JMP&FFEE
  830 .bfs EQUB0:.mons2 EQUB
0:.fnl EQUB0:.monlk EQUB0:.m
onlk2 EQUB0
  840 .ctrlmons LDAbfs:STAfn
l:.mmlp DECfnl:LDAfnl:ASLA:A
SLA:CLC:ADC:&20:STAa:LDA:&C:
STA&8F:JSRmomon:LDAfnl:BNEmm
lp:RTS
  850 .momon LDY:3:LDA(a),Y:
AND:b:BEQmonalv:.monded RTS:
.monalv LDY:2:LDA(a),Y:TAY:L
DA&800,Y:CMP:1:BNEmok:JMPmin
hl
  860 .mok LDA:0:STA&B00,Y:L
DY:3:LDA(a),Y:AND:&40:BEQver
t:JMPhoriz
  870 .vert LDY:1:LDA(a),Y:C
MPgy:BCCmondo:BEQeqv
  880 .monup LDY:2:LDA(a),Y:
SEC:SBC:18:TAY:LDA&800,Y:CMP
:2:BEQeqv:TYA:LDY:2:STA(a),Y
:LDY:1:LDA(a),Y:SEC:SBC:1:ST
A(a),Y
  890 LDY:3:LDA(a),Y:AND:&F0
:ORA:&41:STA(a),Y:JMPnmpos
  900 .mondo LDY:2:LDA(a),Y:
CLC:ADC:18:TAY:LDA&800,Y:CMP
:2:BEQeqv:TYA:LDY:2:STA(a),Y
:LDY:1:LDA(a),Y:CLC:ADC:1:ST
A(a),Y:LDY:3:LDA(a),Y:ORA:&4
3:AND:&F3:STA(a),Y:JMPnmpos
  910 .eqv LDY:3:LDA(a),Y:AN
D:&40:BNEnhor:JMPhoriz:.nhor
 LDY:3:LDA(a),Y:AND:&80:STA(
a),Y:JMPnmpos
  920 .horiz LDY:0:LDA(a),Y:
CMPgx:BCCmonri:BEQeqh
  930 .monle LDY:2:LDA(a),Y:
SEC:SBC:1:TAY:LDA&800,Y:CMP:
2:BEQeqh:TYA:LDY:2:STA(a),Y:
LDY:0:LDA(a),Y:SEC:SBC:1:STA
(a),Y:LDY:3:LDA(a),Y:AND:&B0
:ORA:4:STA(a),Y:JMPnmpos
  940 .monri LDY:2:LDA(a),Y:
CLC:ADC:1:TAY:LDA&800,Y:CMP:
2:BEQeqh:TYA:LDY:2:STA(a),Y:
LDY:0:LDA(a),Y:CLC:ADC:1:STA
(a),Y:LDY:3:LDA(a),Y:AND:&B0
:ORA:2:STA(a),Y:JMPnmpos
  950 .eqh LDY:3:LDA(a),Y:AN
```

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Gunpowder Plot listing

◀ From Page 35

```
D:&40:BEQnver:JMPvert:.nver
LDY:3:LDA(a),Y:AND:&F0:ORA:&
40:STA(a),Y
 960 .nmpos LDY:2:LDA(a),Y:
TAY:LDA&B00,Y:CMP:1:BEQnp2:L
DA:2:STA&B00,Y:.np2 RTS
 970 .minhl LDA:7:LDX:bloop
 MOD256:LDY:bloop DIV256:JSR
&FFF1:JSRinsc
 980 LDY:3:LDA(a),Y:ORA:b:S
TA(a),Y:LDY:0:LDA(a),Y:TAX:I
NY:LDA(a),Y:TAY:JSRcalcadr:L
DAb:STAc:LDA&81:STA&71:LDY:3
:LDA(a),Y:AND:&20:EORmonlk:S
TAd:LDA:&A:STA&73:JSRprint
 990 DECmons2:BEQallded:RTS
:.allded LDA:2:STAflag:RTS
 1000 .insc SED:LDAscore+2:C
LC:ADC:10:STAscore+2:LDAscor
e+1:ADC:0:STAscore+1:LDAscor
e:ADC:0:STAscore:CLD:JMPpsco
re
 1010 .montab EQUB0:EQUW0:EQ
UB1:EQUW&FEC0:EQUB2:EQUW8:EQ
UB3:EQUW&140:EQUB4:EQUW&FFF8
 1020 .pnm JMPpnm2
 1030 .mvmons LDAbfs:STAfnl:
.pmlp DECfnl:LDAfnl:ASLA:ASL
A:CLC:ADC:&20:STAa:LDA:&C:ST
A&8F:LDAfnl:ASLA:CLC:ADC:&C0
:STA&8C:LDA:&C:STA&8D
 1040 LDY:3:LDA(a),Y:AND:b:B
NEpnm:LDY:0:LDA(&8C),Y:STAc:
INY:LDA(&8C),Y:STA&71
 1050 LDY:3:LDA(a),Y:AND:&20
:EORmonlk2:STAd:LDA:&A:STA&7
3:LDY:3:LDA(a),Y:AND:&20:EOR
monlk:STA&76:LDA:&A:STA&77
 1060 LDY:3:LDA(a),Y:AND:&F:
LDY:0:.sfpma CMPmontab,Y:BEQ
fndpma:INY:INY:INY:JMPsfpma:
.fndpma INY:LDAmontab,Y:STA&
8A:INY:LDAmontab,Y:STA&8B
 1070 LDY:0:LDA(&8C),Y:CLC:A
DC&8A:STA(&8C),Y:STA&74:LDY:
1:LDA(&8C),Y:ADC&8B:STA(&8C)
,Y:STA&75:JSRsprite:.pnm2 LD
Afnl:BNEpmlp1:LDAmonlk:STAmo
nlk2:RTS:.pmlp1 JMPpmlp
 1080 .bloop EQUW&11:EQUW4:E
QUW80:EQUW6
 1090 .event LDA:129:LDX:&AE
:LDY:&FF:JSR&FFF4:TYA:BNEson
 1100 LDA:129:LDX:&EF:LDY:&F
F:JSR&FFF4:TYA:BNEsoff:RTS
 1110 .son LDA:0:STA&262:RTS
:.soff LDA:1:STA&262:RTS
 1120 INEXT:?&220=event MOD2
56:?&221=event DIV256:*FX14
4
 1130 ENDPROC
 1140 DATA&72307733,&3311103
0,&2EEAC8A8,&4C888084,&33334
323,&30100011,&CCCCCC4C,&808
08088,&72307733,&33111030,&2
EEAC8A8,&4C888084,&33334323,
&60202011,&CCCCCC4C,&C040408
8
 1150 DATA&47773351,&2311101
2,&E4C0EECC,&CC8880C0,&33333
323,&10101011,&CCCC2C4C,&C08
00088,&47773351,&23111012,&E
4C0EECC,&CC8880C0,&33333323,
&30202011,&CCCC2C4C,&60404088
 1160 DATA&3773271,&33111003
,&EFFEECC,&CECCC00E,&3313131
3,&30101011,&EEEECECE,&6040C
C,&3773271,&13111003,&EFFEEC
C,&EECCC00E,&33331313,&30101
1,&EECECECE,&604040CC
 1170 DATA&13763311,&3311101
2,&C6F3ECDC,&EECCC04A,&33331
213,&301011,&EECACEEE,&60404
0CC,&13763311,&33111012,&C6F
3ECDC,&EECCC04A,&33121333,&3
0101011,&EEEECACE,&6040CC
 1180 DATA&15E14100,&2515141
4,&C40F0C00,&2CCCC048,&25632
725,&30141405,&2C2C6A2E,&604
00C,&1507E140,&25151414,&C40
F0C00,&2CCCC048,&25256327,&3
01405,&2C6A2E2C,&6040400C
 1190 DATA&7F370300,&C0B377F
,&EBCA2C10,&30DCEEF,&5E7E5E0
F,&3070F7E,&6B7BA70F,&C0E0F7
B
 1200 DEFPROCinstruct:VDU23;
8202;0;0;0;19,3,4;0;:COLOUR2
:PRINTTAB(5,4)"Fawkes Run":C
OLOUR3:PRINTTAB(9,6)"by"TAB(
5,7)"A.Houghton"
 1210 COLOUR1:PRINTTAB(5,10)
"Z - Left"TAB(5)"X - Right"T
AB(5)"* - Up"TAB(5)"? - Down
"
 1220 COLOUR2:PRINT'TAB(5)"S
 - Sound On"TAB(5)"Q - Sound
 Off"TAB(2)"Copy - Pause"TAB
(0)"Delete - Restart"TAB(0)"
Escape - End Game"
 1230 ENDPROC
 1240 DEFPROCwait:AD%=&5950:
DA%=&A00:FORN%=1TO5:!c=AD%+&
10000*DA%:CALLprint:AD%=AD%+
64:NEXT
 1250 AD%=&7D90:DA%=&A20:FOR
N%=1TO5:!c=AD%+&10000*DA%:CA
LLprint:AD%=AD%+64:NEXT
 1260 COLOUR3:PRINTTAB(0,28)
"Press Space to play":*FX15
 1270 REPEAT:AD%=&5950:FORN%
=1TO5:!c=AD%+&10000*DA%:!&74
=AD%+&10000*(DA%EOR&20):CALL
sprite:AD%=AD%+64:NEXT
 1280 DA%=DA%EOR&20:AD%=&7D9
0:FORN%=1TO5:!c=AD%+&10000*D
A%:!&74=AD%+&10000*(DA%EOR&2
0):CALLsprite:AD%=AD%+64:NEX
T
 1290 UNTILINKEY(0)=32:ENDPR
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

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TO ORDER TURN TO THE FORM ON PAGE 53

Recursion and palindromes

In Part 2 of his introduction to programming ROLAND WADDILOVE explores Logo's vocabulary

THE programming language Logo is a bit of an oddity: Most people have heard of it and many have programmed with it, yet for a language so widely used, it is surprising how little is known about it.

Logo has become famous for its turtle graphics and it is in this area where most people's experience of the language lies.

An object – the turtle – can be directed about the monitor screen (or floor if you invest in the necessary hardware) using very easy-to-learn commands that can be picked up in a few minutes.

This simplicity and ease of use is one of the reasons for its popularity as an educational tool for teaching mathematics and geometry in school. It enables young children to explore the physical world around them in a way not normally possible.

For instance, it's easy to tell someone to go and stand in the corner of the room, but a completely different matter guiding a turtle. The turtle requires precise directions and distances in order to negotiate any obstacles such as chairs and tables.

Unfortunately, turtle graphics and Logo have become synonymous and it is often thought that Logo merely consists of the 20 or so turtle graphics commands like FORWARD, BACK, LEFT, RIGHT, PENUP, PENDOWN and so on.

In fact, turtle graphics is a very small – but important – part of the very large and complex programming language Logo. The Acornsoft implementation for the Electron, available on rom cartridge, has over 200 commands in its vocabulary.

With a language this vast it is impossible to cover it completely in three articles. However, I hope to give you an insight into the power and structure of the language with a few short example programs.

Having dispensed with turtle graphics last month in the first article of the series, it's time to move on to the rest of the language.

Let's start with straightforward printing on the screen. Plug in your Logo cartridge and type TS to switch to the text screen – we're not doing any turtle graphics.

Logo's PRINT command isn't like Basic's. To see the difference, enter:

```
PRINT "Hello
PRINT "Good morning
```

Notice there is an opening quote, but no corresponding closing quote, and that the second instruction produces the error message "Logo doesn't know how to morning"

PRINT simply prints the word immediately following the quote. Since spaces are used to separate commands and parameters in Logo and PRINT takes just one parameter, the third word – morning – must be another command. Logo hasn't been told what this is, however, and reports an error.

How can we get round this? One way is to tie the two words together with a "top hat" symbol or enclose the text in square brackets like:

```
PRINT "Good^ morning
PRINT [Good morning]
```

Square brackets have a special meaning in Logo. If you cast you mind back to Lisp, you'll recall that brackets (round in this case) were used to indicate a list.

Logo is also a list processing language and uses brackets in the same way. A list is treated as a single object by PRINT and it displays the contents, but not the surrounding brackets.

A word very like PRINT is TYPE. The difference being that PRINT also adds a carriage return at the end of the text, whereas TYPE doesn't – printing continues on the same line. This can be shown with:

```
TYPE "Hello TYPE "Hello
PRINT "Hello PRINT "Hello
```

The first command prints the Hellos on the same line while the second prints them on separate lines.

We can create variables to store text and numbers as in Basic, though the syntax is somewhat different, so:

```
MAKE "greeting "Hello
```

associates the word Hello with the variable *greeting*, and:

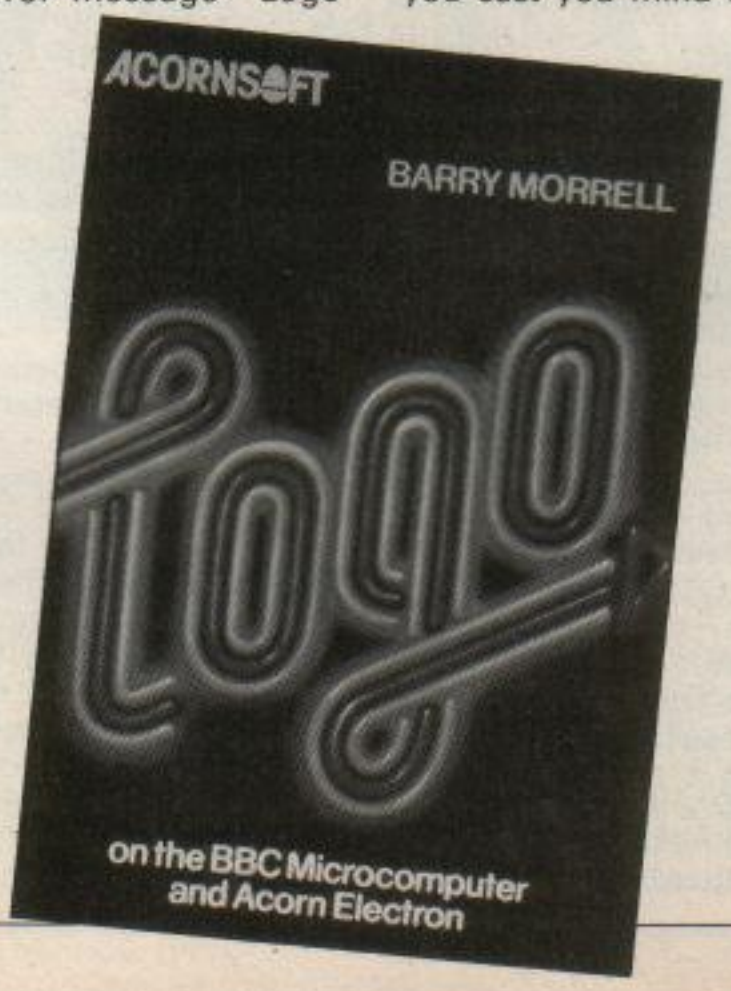
```
MAKE "message [Good morning]
```

associates the list of words [Good morning] with the variable *message*.These can now be used within programs:

```
PRINT :greeting
PRINT :message
```

Note the colon in front of

Turn to Page 38 ▶



Programming

◀ *From Page 37*

each variable name – this is to distinguish it from a procedure name.

Variables can just as easily contain numbers as words or lists and there's nothing to distinguish a numeric one from any other:

```
MAKE "n1 5
MAKE "n2 6
```

and we can perform calculations on them:

```
PRINT :n1 * :n1
PRINT COS :n1
PRINT SQRT (:n1 + :n2)
```

We can also input values from the keyboard using READWORD and READLIST and assign them to variables like with Basic's INPUT. The former reads a single word (which could be a number) and the latter reads a whole line of text. Enter the following commands, typing some text after each MAKE:

```
MAKE "x READWORD
MAKE "y READLIST
PRINT :x
PRINT :y
```

Like Basic there is an IF command. In fact there are several variations as we'll see. Enter:

```
MAKE "x 5
IF :x<9 [PR "T]
IF :x>9 [PR "T] [PR "F]
TEST :x < 9
IFTRUE [PR "T]
IFFALSE [PR "F]
```

Here we MAKE the variable *x* equal to 5. The first IF statement tests to see if *x* is less than nine. It is so the command in square brackets is executed and T for True is printed – PR is short for PRINT. This is the equivalent of Basic's IF ... THEN ... statement.

The second IF tests whether *x* is greater than nine. It isn't so the first list of commands on the line is ignored and the second list is executed instead. F for False is printed. This is like Basic's IF ... THEN ... ELSE ... statement.

Alternatively we can TEST the condition before the IF statement. The result of TEST is remembered until another comparison (not necessarily performed by a TEST function) is executed.

IFTRUE and IFFALSE examine the result of the last comparison and execute the lists following if the condition is met.

We'll now see how these commands can be incorporated into a program. Here is a short Logo listing which asks for a word to be input then tests to see if it is a palindrome:

```
TO Palindrome
TS
PRINT
PRINT "Palindrome" Tester
TYPE [Enter a word:]
MAKE "pal CAPS READWORD
TEST :pal = REV :pal
IFTRUE [PR "Yes]
IFFALSE [PR "No]
END
TO REV :w
IF :w = " [OP "]
OP word LAST :w REV BL :w
END
```

A palindrome is a word that reads the same when spelt backwards as it does spelt normally. Two short examples are MUM and DAD – ROTOR is a slightly longer one.

If you've got Acornsoft's Logo on rom cartridge you can enter this listing. Run it by typing Palindrome. Despite the short length, this is actually a complex program which utilises a recursive function.

The first procedure, Palindrome, is fairly straightforward and you've met all the commands before apart from CAPS. This converts lower case letters to capitals.

The first line of Palindrome tells Logo we want to define a new word called Palindrome, the body of the definition follows.

TS switches to the text-screen – this is where text is printed. The PRINT on its own prints a blank line on the screen while the next PRINT displays the title. Notice the quote at the start of the text but not at the end, and the top hat character joining Tester to Palindrome so PRINT accepts them as one word.

The next line displays the prompt. PRINT could have been used here, however, it also adds a carriage return at the end of the line. TYPE does the same job except it does not print the carriage return enabling you to input your word following the prompt.

READWORD is used to input the word and CAPS ensures the letters are all capitals. MAKE stores the word in the variable *:pal*.

The TEST function tests whether the input word stored in *:pal* is the same spelt backwards.

REV takes *:pal* and reverses it by recursively calling itself, stripping off the last letter of the word each time and building a new one. This is a function which outputs a value using OP the abreviation for OUTPUT.

Recursion is always difficult to follow so here is another example of a recursive Logo function to calculate the factorial of a number:

```
TO Factorial :n
IF :n=1 [OUTPUT 1]
OUTPUT :n * Factorial :n-1
END
```

To calculate the factorial of a number, say 5, enter:

```
PRINT Factorial 5
```

Finally, let's look at something completely different. Logo is a structured language (though it does have GOTO), and encourages good programming techniques. As you program, you add words to its vocabulary and build up its knowledge.

Entering a Logo program isn't like entering a Basic one. With Logo you are effectively teaching it new procedures, and you can build on what you teach it.

To illustrate this, we can teach Logo to speak French, German or almost any European language you like. (Some languages such as Chinese use completely different characters which can't be reproduced on the Electron).

To do this, we copy the definition of a word using COPYDEF like:

```
COPYDEF "AVANCE "FORWARD
COPYDEF "RECULE "BACK
COPYDEF "GAUCHE "LEFT
COPYDEF "DROITE "RIGHT
COPYDEF "REPETE "REPEAT
COPYDEF "FIN    "END
COPYDEF "POUR   "TO
```

and so on, copying all the built-in primitive Logo definitions. When we've finished, we can program in French like:

```
POUR carre :longueur
REPETE 4
[
AVANCE :longueur
GAUCHE 90
]
FIN
```

and execute the program by entering carre. You could also redefine some of the character set to produce accents and a cedilla.

In one multi-racial school in America where Logo is extensively used, bilingual pupils are teaching Logo new languages to enable those pupils who have little knowledge of English to program the school's computers.

You could just as easily teach it geography and guide the turtle around a map using NORTH, SOUTH, EAST, WEST and so on. There are many possibilities waiting to be discovered.

● *Next month in the last part of this brief series looking at Logo we'll examine some more short but fascinating programs.*

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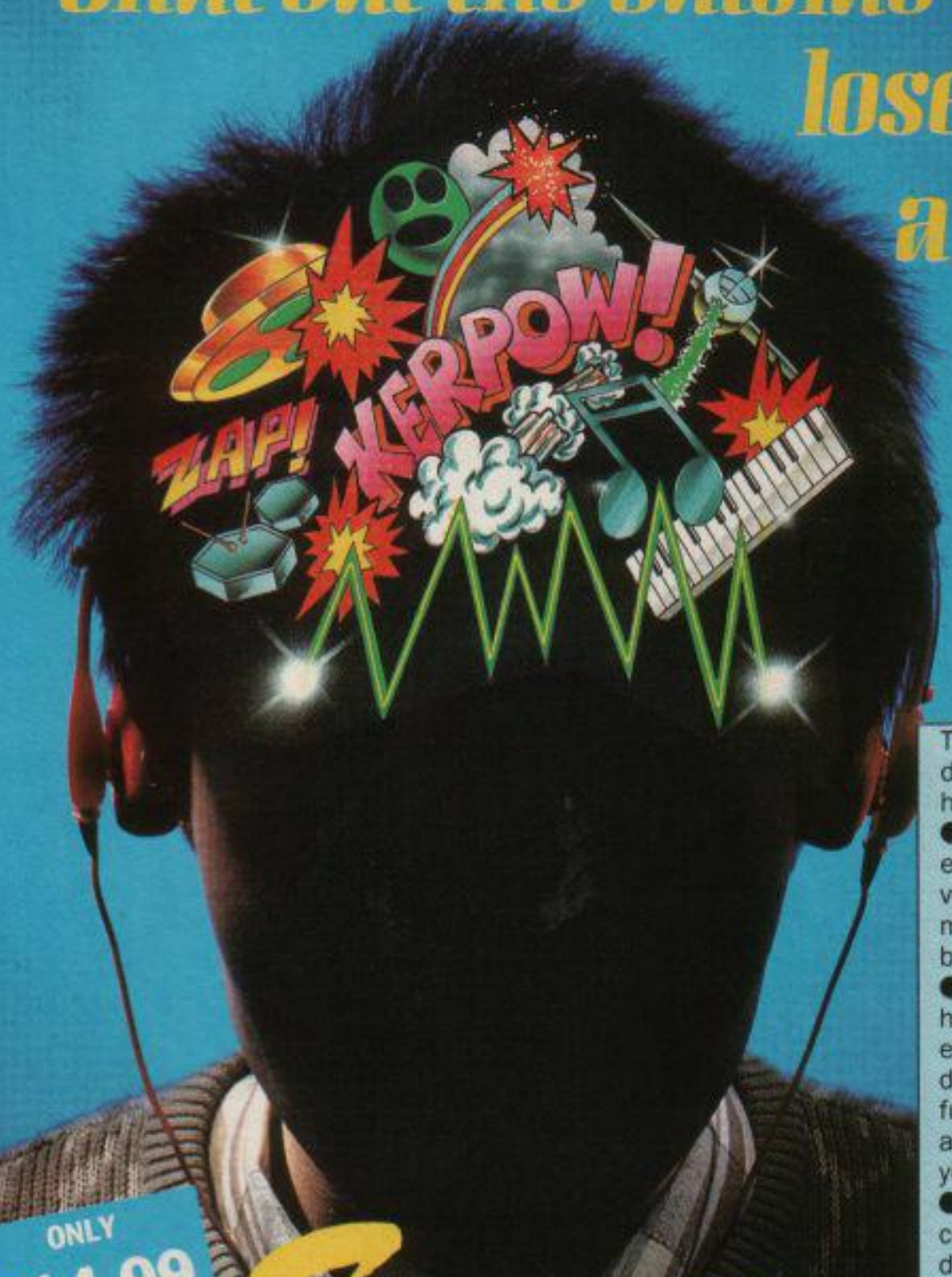

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Keeping track

MARK SMIDDY explores the ADFS free space map

IN the September 1987 issue of *Electron User*, Paul Clarke and Jeff Neild demonstrated a faster way of compacting a fragmented Plus 3 disc using the *MAP command to examine the free space map. This map is used by the ADFS to keep track of all unused sectors on a disc.

To understand how this works it is first necessary to understand the physical layout of an ADFS disc.

When formatted it contains no information, but it is by no means blank. The format program divides the disc into 80 magnetically coded tracks, each track being sub-divided into 16 segments called sectors see Figure I.

Each individual sector can hold up to 256 bytes of information, so the disc can theoretically store 80*16*256 (320k) bytes in total. This in fact, is only an approximation because the ADFS immediately claims some of the disc for its own use.

The first two sectors of track zero are used to store the free space map and the next five to store the root directory $. Any sub-directories you create also claim five sectors (1280 bytes) for themselves, something worth bearing in mind.

When a file is saved to disc the ADFS modifies the free space map to take account of the amount of space used and where.

More importantly, when old data or files are deleted the sectors they occupied are declared empty in the free space map. The data is still there, but the ADFS doesn't know about it.

With normal use, areas of free space, some only one sector long, appear scattered all over the disc. You can ask the ADFS where they are by typing *MAP, which will produce a list something like:

```
*MAP
Address :  Length
000013  :  000004
00048B  :  000075
```

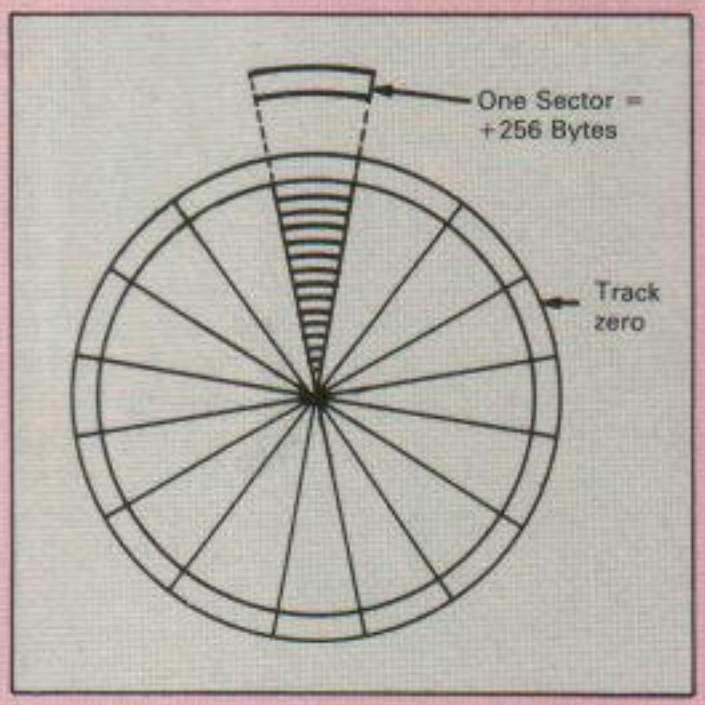

Figure I: The sector divisions on an ADFS disc

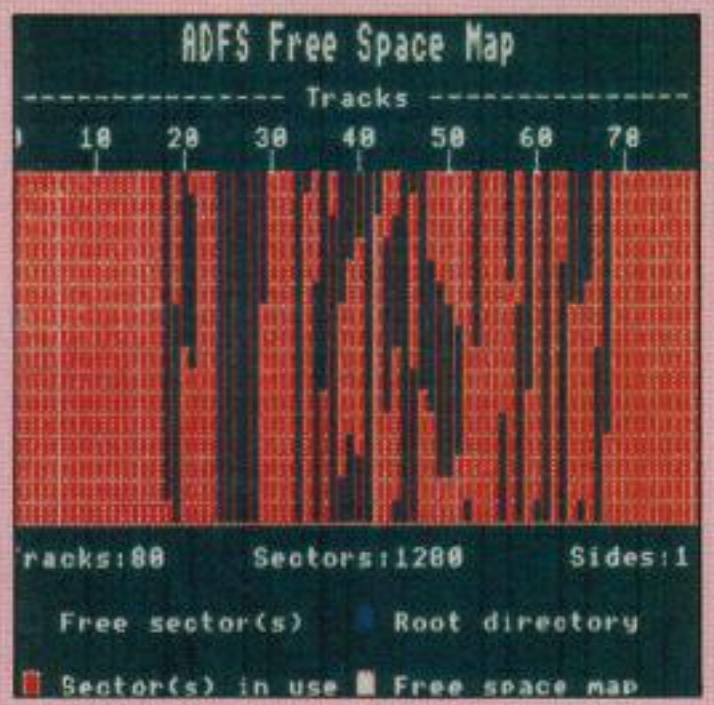

Figure II: A disc needing compaction

The output from this command is in hexadecimal, the disc address being calculated from the track and sector numbers like this:

```
Address=track*16+sector
```

To convert back into track and sector we need to divide by 16, the integer of the result is the track number, the remainder is the sector. For instance:

```
PRINT "Track:"; &13 DIV 16
PRINT "Sector:"; &13 MOD 16
```

The length referred to in the map list is the size of the space in sectors expressed in hexadecimal. To convert this to bytes simply multiply the number by 256.

For the above example, the first space is at track one, sector three and is 1k long and the second at track 72, sector 11 is just over 29K long.

The free space map can hold up to 82 entries before the ADFS gives a "Compaction required" error message, but if you want to find out exactly where these areas are you will have to examine the map yourself and do a lot of converting.

The accompanying listing is a short utility to examine the disc and show graphically exactly how the ADFS has allocated space on the disc. Figures II and III are examples of the program's output.

The disc has been drawn as a chart, with the tracks running horizontally and the sectors vertically. There are 1280 divisions, one for each sector.

A key at the bottom of the screen shows important disc information and the meaning of each coloured sector. A Plus 3 disc always has 80 tracks on one side, but this information has been included for completeness.

The large red areas are

PROCEDURES

vars	Calculate disc information
info	Display disc information
init	Initialise the program
grid	Draw the grid
key	Draw the sector key

VARIABLES

base	Address of the sector
size	Size of the free space map
blk	Work area for osword
J%	Current disc address
T%	Current track number
S%	Current sector number

```
  10 REM ADFS Exposed
  20 REM by Mark Smiddy
  30 REM (c) Electron User
  40 MODE 6
  50 PROCinit
  60 PROCread_disc
  70 MODE 1
  80 VDU 19,2,4;0;
  90 VDU 23;8202;0;0;0;
 100 PROCgrid
 110 PROCkey
 120 PROCvars
 130 PROCdouble("ADFS Free
Space Map",10,1)
 140 PROCinfo
 150 PROCfs_map
 160 PROCcatalogue
 170 PROCfind_free_sectors
 180 VDU 7
 190 REPEAT UNTIL 0
 200 :
 210 DEF PROCinit
 220 DIM W% &200:DIM blk 15
 230 VDU 23:FOR N=0 TO 8:VD
U 224:NEXT
 240 ENDPROC
 250 :
 260 DEF PROCvars
 270 base=W%
 280 size=base?&1FE
 290 sectors=base?&FC+base?
&FD*256
 300 tracks=sectors/16
 310 sides=tracks/80
 320 disc_size=sectors*256
 330 ENDPROC
 340 :
 350 DEF PROCdouble(A$,X,Y)
 360 X%=0:Y%=10:A%=10:D=&A0
0
 370 FOR N%=1 TO LEN A$
 380 VDU 31,X+N%-1,Y
 390 ?D=ASC(MID$(A$,N%,1)):
CALL&FFF1
 400 VDU 23,225,D?1,D?1,D?2
,D?2,D?3,D?3,D?4,D?4
 410 VDU 23,226,D?5,D?5,D?6
,D?6,D?7,D?7,D?8,D?8
 420 VDU 225,10,8,226
 430 NEXT
 440 ENDPROC
 450 :
 460 DEF PROCfs_map
 470 disc_address=0:disc_sp
ace=2
 480 GCOL 3,2:PROCshow_free
_sectors
 490 ENDPROC
 500 :
 510 DEF PROCcatalogue
 520 disc_address=2:disc_sp
ace=5
 530 GCOL 3,3:PROCshow_free
_sectors
 540 ENDPROC
 550 :
 560 DEF PROCfind_free_sect
ors
 570 GCOL 3,1
 580 FOR N%=0 TO size-1 STE
P3
 590 disc_address=?(base+N%
)+(?(base+N%+1))*256
 600 disc_space=?(base+&100
+N%)+(?(base+&100+N%+1))*256
 610 PROCshow_free_sectors
 620 NEXT
 630 ENDPROC
 640 :
 650 DEF PROCshow_free_sect
ors
 660 VDU 5
 670 FOR J%=disc_address TO
 disc_address+disc_space-1
 680 T%=J% DIV 16
 690 S%=J% MOD 16
 700 X%=T%*16
 710 Y%=768-S%*32
 720 MOVE X%,Y%:VDU224
 730 NEXT
 740 VDU 4
 750 ENDPROC
 760 :
 770 DEF PROCinfo
 780 PRINTTAB(0,4);"<";STRI
NG$(15,"-");" Tracks ";;STRI
NG$(15,"-");">";
 790 PRINTTAB(0,25);"Tracks
:";tracks;TAB(14,25);"Sector
s:";sectors;TAB(32,25);"Side
s:";:IF sides>=1 PRINT;sides
; ELSE PRINT;"1";
 800 ENDPROC
 810:
 820 DEF PROCkey
 830 PROCsqr(32,0,1,3):PRIN
TTAB(3,31);"Sector(s) in use
";
 840 PROCsqr(32,100,0,2):PR
INTTAB(3,28);"Free sector(s)
";
 850 PROCsqr(640,100,2,0):P
RINTTAB(22,28);"Root directo
ry";
 860 PROCsqr(640,0,3,1):PRI
NTTAB(22,31);"Free space map
";
 870 ENDPROC
 880 :
 890 DEF PROCsqr(X,Y,C1,C2)
 900 GCOL 0,C1
 910 MOVE X,Y
 920 MOVE X,Y+38
 930 PLOT 85,X+30,Y
 940 MOVE X+30,Y+38
 950 PLOT 85,X,Y+38
 960 GCOL 0,C2
 970 MOVE X,Y
 980 PLOT 29,X+30,Y
 990 PLOT 29,X+30,Y+38
1000 PLOT 29,X,Y+38
1010 PLOT 29,X,Y
1020 ENDPROC
1030 :
1040 DEFPROCread_disc
1050 *MOUNT
1060 blk?0=0
1070 blk?1=W% MOD 256
1080 blk?2=W% DIV 256
1090 blk?3=&FF:blk?4=&FF
1100 blk?5=8
1110 blk?6=0:blk?7=0:blk?8=
0
1120 blk?9=2
1130 blk?10=0
1140 A%=&72:X%=blk MOD 256:
Y%=blk DIV 256
1150 CALL&FFF1
1160 ENDPROC
1170 :
1180 DEF PROCgrid
1190 GCOL 0,129
1200 VDU 24,0;256;1276;768;
16,26
1210 GCOL 0,128
1220 GCOL 0,3
1230 FOR X%=0 TO 1280 STEP
16
1240 MOVE X%,256:PLOT 29,X%
,768
1250 NEXT
1260 FOR Y%=256 TO 768 STEP
32
1270 MOVE 0,Y%:PLOT 29,1279
,Y%
1280 NEXT
1290 T%=0
1300 FOR X%=4 TO 1276 STEP
160
1310 MOVE X%,768:DRAW X%,80
0
1320 VDU 5:IF T%=0 MOVE X%,
832:PRINT;T% ELSE MOVE X%-32
,832:IF T%<80 PRINT;T%;
1330 T%=T%+10
1340 NEXT:VDU4
1350 ENDPROC
```

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MicroLink

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This listing is included in this month's cassette tape offer. See order form on Page 53.

the sectors in use by files and directories other than $. The black areas are sectors in the free space area.

In Figure II these areas are scattered all over the disc, wasting space. Figure III, shows a disc after compaction. The free area here starts at track 14, sector one.

While testing the program, it is essential to write protect the disc in use, since the program accesses the disc controller directly and an error here could cause a loss of data.

The reason for reading the disc directly was to provide compatibility for second processors and alternative ADFS systems should they ever appear. It is also a more elegant method.

If you wish to access the ADFS workspace directly delete lines 1060 to 1150 and insert the following line:

```
1060 W%=&E00:ENDPROC
```

When the program has finished the computer will bleep, then wait in an infinite loop to prevent the prompt from appearing. Press Escape to return control to Basic. ■

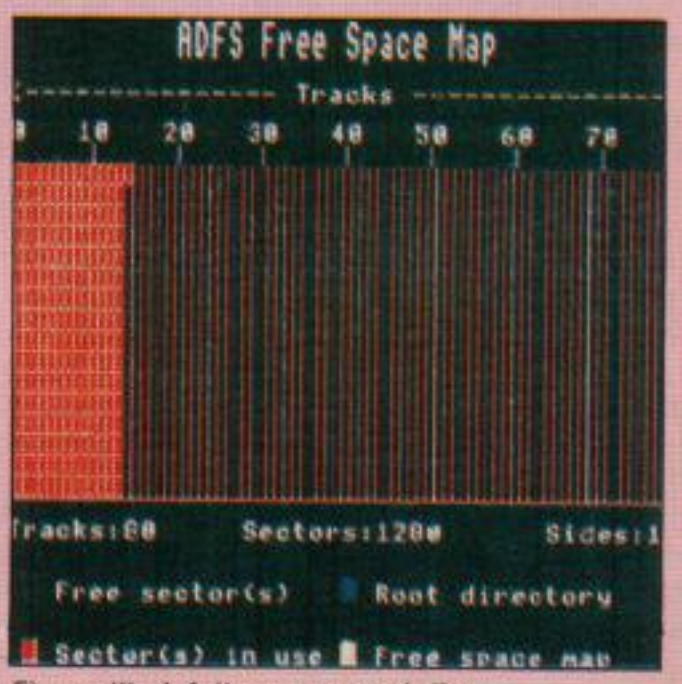
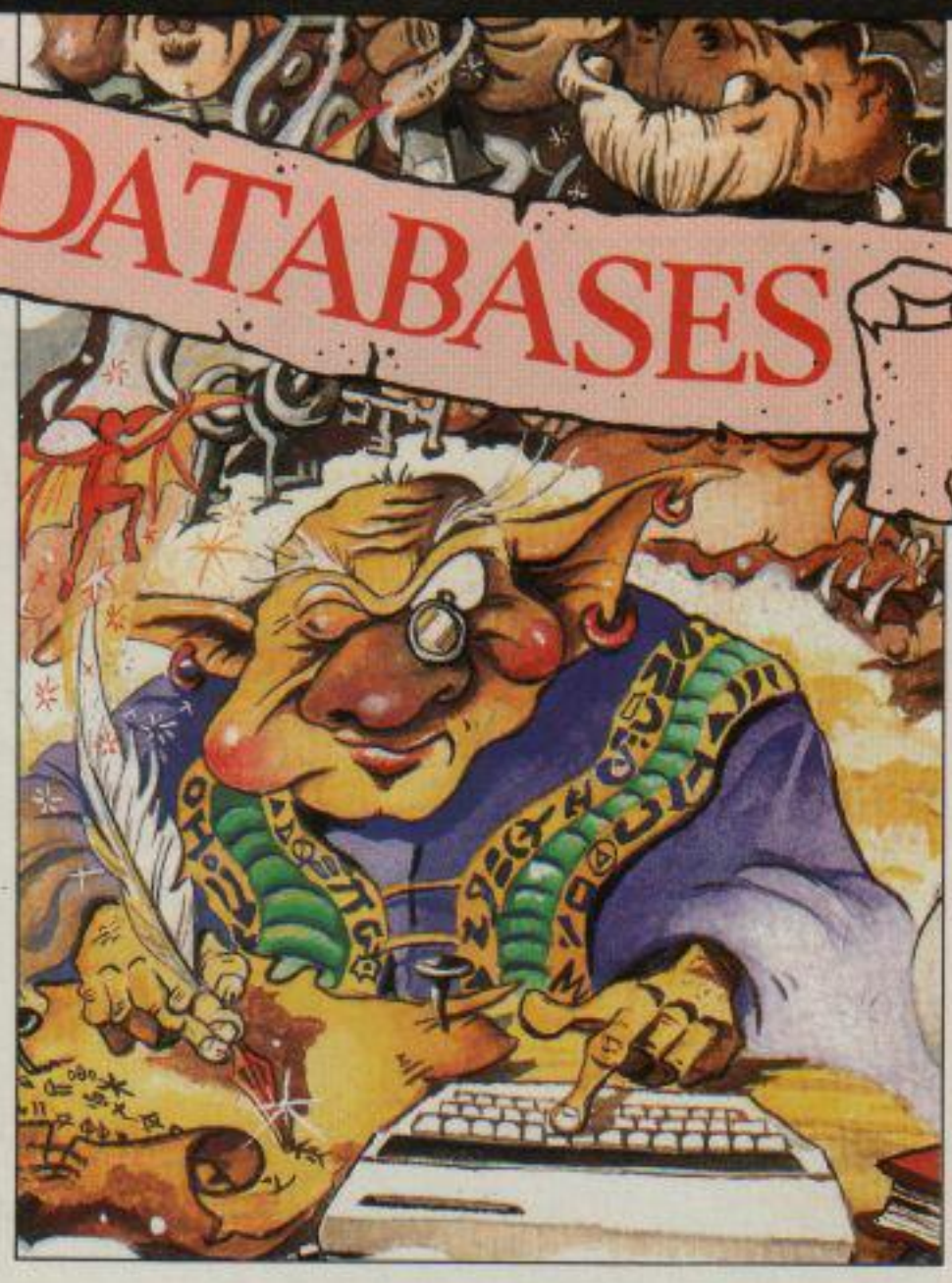


Figure III: A fully compacted disc

DEMONIC DATABASES



BILL TREVELYAN describes mapping and movement in Part V of his adventure writing series.

AN ADVENTURE game is an electronic version of the Victorian magic lantern show. Location descriptions, spiced with comments, are the slides and shown in the right order, create the impression that a plot is being unfolded.

The adventurer, though, has to discover the author's intention by trial and error, aided by imagination and – sometimes – even a little logic.

The player attempts to move, that is to alter the current location number and description, by entering a directional command such as NORTH, SOUTH, UP or DOWN. A subroutine is called which deals specifically with such commands. This must have access to the following information:

- Is there an exit from the current location in the direction specified by the player, or must he be told "You can't go that way!" ?
- If there is an exit, is an exit program in operation? A door, for example which the player must first open. If so control must be passed to this subroutine and a message duly given.
- If exit is allowed, what will be the number of the new location?

In the skeletal game described in Part III, (*Electron User* September 1987) movement was allowed only in a north-south line. A move north meant incrementing the location number by one and a move south, decrementing it by one.

This technique of finding the new location number by calculation, rather than by consulting a table, can be extended to two or even three dimensions.

Suppose for instance that you take a sheet of graph paper and mark off a square 16cm by 16cm, enclosing 256 small squares each 1cm by 1cm. Number the bottom row 0 to 15, the next row up 16 to 31, the next 32 to 47, and so on. Now pick any square – number 168, say.

Expressed in hexadecimal, this becomes &A8. Because the numbering starts with zero and not one, &A8 is the square that is nine to the right of the origin and eleven up. The square to the north of this is &B8, to the south &98, to the east &A9, and to the west &A7.

To move north add &10, to go south subtract &10. east/west: Add/subtract &01. Simple, isn't it? But in an adventure you don't want to move over the entire surface, only in a predetermined pattern.

The easiest way to do this is to put into the database a list of the permitted location numbers – just as we put in a list of permitted verbs and objects. Calculate what the new location number would be if a move were to be allowed and check if it's on the list. If so, move, If not, inform the player "No exit this way".

Program I demonstrates the principle. You move by entering any of the eight compass directions in the form given in line 70, Q for quit ends the program.

This is translated into a number between one and eight and the amount to be added to the current location number can then be selected from the eight possible values stored in an array *inc%* lines 60-80.

The calculated new location number is now compared in turn with a list of permitted location numbers held in a data statement at line 1000, though in practice they would be stored directly in memory, using only one byte per item. This is of course the reason for having only 256 squares.

Note that a location has, two numbers associated with it. The one giving its position on the 16x16 chequerboard, and the one giving its position in the permitted list, 1-15 in Program I which would be used to access the appropriate description stored in the database.

If the list of permitted locations is held directly in memory, it can be written to. as well as read. This gives the opportunity to create and delete exits in a very simple way.

Another method is to assign two bytes to each permitted location, one with the location coordinates, the other showing which of the eight possible moves is allowed. Each direction would be represented by one bit, thus a byte holding &72, being in binary 01110010 might show that you could move S, E, W, SE but not N, NE, NW, SW depending on which direction you assigned to each bit.

With a two byte number there are 256*256 possible variations, allowing a quite complicated two, three or even four dimensional pattern. However, the method isn't much used. Usually, locations are numbered successively from one

upwards.

In the database is a table of movement codes consisting of four bytes for each location if movement is only possible north, south, east and west or up to 10 bytes for movement in all compass directions plus up and down.

The first byte in a set corresponds to movement north, if its value is zero, there is no exit in this direction. If it is, say, 37 then a move will change the current location number to 37.

It is assumed there are no more than 200 locations in all, a fairly safe assumption with a Basic program. It is obvious the table is going to use a fairly large chunk of memory even with direct storage. No other method is worth consideration.

In fact it is unlikely there will be more than a hundred locations in our game – which means only seven out of the eight bits in the bytes of the movement codes are being used. Bit seven is thus free for use as a flag. Here it will be set to show there may be an exit program in force for the particular location and direction.

The first step is to draw a diagram on squared paper showing all the locations in the game and the links between them. Unfortunately, the method permits irrational movements when, for instance, you can move north from A to B but you can't then get from B back to A by going south. You can't do this with the calculation procedure, besides which too much of this can be intensely irritating.

In Program II there are six possible ways to move. The data is first entered as data statements, one line per location. The first figure in each line is a location number, the numbers don't have to be in order.

The next is a message number which enables the player to be told what hazard he is facing, in this case a closed door. Then follow the locations reached by going north, south and so on. A partially completed list can be saved to tape or disc, then loaded for another session.

If an exit program is in force, 128 is added to the location number in the simple manner shown. Only one exit program per location is catered for, though it can be triggered by a move in any of the six possible directions.

Chain Program II and store the list at &2000. Now load the demonstration Program III. When this is run, there appears on the screen the number of the location you have just moved to – *L%* – and the number of the location you have moved from – *Q%* – standing for quondam, which means the former.

These numbers, standing in for location descriptions, appear only if you have moved, that is if *Q%* and *L%* are different. The move subroutine, is PROCd(v%). If you enter a direction as command at line 100 the simple command parser substitutes a number for the verb string and passes it to the subroutine.

The destination which would be reached by the move is examined in line 1030. Is it zero? Then tell the player "No exit this way!" and ask for another command. Is the destination number greater than 128? If it is, there is an exit program to contend with.

Is it currently in force or is the way clear? The value of a flag variable tells you that. The flags are stored in the first 128 bytes of page 12 (&C00 - &CFF) we can afford to be lavish here, as you can't use this area of memory for Basic programming.

When the program is run, all the flags are set to false at line 40. The reason for introducing extra flags rather than altering bit seven in the destination byte is to simplify saving the game position to tape. Refer to Part III of Demonic Databases in September's *Electron User* for further information.

If the exit is blocked, the subroutine prints a message and re-enters the main loop at line 1040. Otherwise, or if there is no exit program to consider, the destination becomes the current location *L%* and a description is printed before returning to get another command. This includes a list of possible exits from the new location.

In this demonstration program, you can open or close the door in location two. Once you pass through to location three, you can close the door, but then you can't reopen it.

Appropriate messages are delivered depending on the state of the door and what you tried to do with it. If you have just started programming adventures, you might like to try altering PROCop and PROCcl to produce different effects, or introduce locking and unlocking the door as well.

Note that there is only one move subroutine PROCd(v%). If you don't want to use bit seven of the destination bytes to show where there is an exit program, an alternative is to have a different subroutine for each possible direction - PROCnorth, PROCsouth and so on. You would then refer to a list of flags and of message numbers as before, or simply stipulate each program individually:

```
   10 DEFPROCeast:IF L%=2 AN
D flag%?2=0 THEN PROCm(1):EN
DPROC
   20 DEFPROCwest:IF L%=3 AN
D flag%?3=0 THEN PROCm(1):EN
DPROC
```

This choice between presenting each possibility as an IF ... THEN statement in the body of the program, and storing the alternatives as a list in the database comes up again and again with adventure programs written in Basic.

● *Next month, we'll start to put everything together and begin construction of a complete and challenging game.*

Program I

```
   10 REM Program I
   20 :
   30 MODE 6
   40 DIM dir$(8),inc%(8)
   50 FOR I%=1 TO 8:READ a$:
dir$(I%)=a$:NEXT
   60 FOR I%=0 TO 8:READ a%:
inc%(I%)=a%:NEXT
   70 DATA N,S,E,W,NE,NW,SE,
SW
   80 DATA 0,16,-16,1,-1,17,
15,-15,-17
   90 oldloc%=1:newloc%=oldl
oc%:loc%=0
  100 REPEAT:CLS:PRINT''' "O
ld location is &";
  110 IF oldloc%<16 PRINT "0
";~oldloc% ELSE PRINT;~oldlo
c%
  120 PRINT"New location is
 &";
  130 IF newloc%<16 PRINT "0
";~newloc% ELSE PRINT;~newlo
c%
  140 IF loc%=&FF PRINT"No
exit this way!"
  150 PRINT"Enter direction
."
  160 INPUT TAB(7)"Q to quit
: "dir$
  170 IF dir$="Q" THEN CLS:E
ND
  180 dir%=0:FOR I%=1 TO 8
  190 IF dir$=dir$(I%) THEN
dir%=I%:I%=8
  200 NEXT
  210 :
  220 PROCd(dir%)
  230 :
  240 UNTIL FALSE
  250 END
  260 :
  270 DEFPROCd(d%)
  280 L%=0:oldloc%=newloc%
  290 RESTORE 1000
  300 REPEAT:L%=L%+1
  310 READ loc%
  320 IF loc%=newloc%+inc%(d
%) THEN newloc%=loc%:UNTIL T
RUE:ENDPROC
  330 UNTIL loc%=&FF
  340 ENDPROC
  350 :
 1000 DATA 1,17,18,19,35,38,
52,53,54,70,86,87,104,106,12
1,255
```

Program II

```
   10 REM Program II
   20 :
   30 MODE 6
   40 dnum%=6
   50 INPUT""'"List to start
at: &"list$
   60 list%=EVAL("&"+list$)
   70 code%=list%:end%=0
   80 RESTORE 1000
```

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◀ From Page 43

```
   90 :
  100 REPEAT
  110 READ L%
  120 IF L%=&FF UNTIL TRUE:G
OTO 200
  130 code%=list%+(dnum%+1)*
L%
  140 FOR I%=0 TO dnum%
  150 READ D%
  160 code%?I%=D%:NEXT
  170 IF code%>end% THEN end
%=code%
  180 UNTIL FALSE
  200 PRINT""List ends at
address &";~end%
  210 PRINT ""SAVE list? (Y
/N)"
  220 a$=GET$:IF a$<>"Y" AND
 a$<>"y" THEN CLS:END
  230 INPUT"Enter filename:
"file$
  240 PRINT
  250  "SAVE "+file$+" "+lis
t$+" "+STR$~end%
  300 END
  310 :
 1000 DATA 0,0,0,0,0,0,0,0,0
 1001 DATA 1,0,2,0,0,0,0,0,0
 1002 DATA 2,1,0,1,128+3,0,0
,0
 1003 DATA 3,1,0,0,4,128+2,0
,0
 1004 DATA 4,0,5,0,0,3,0,0
 1005 DATA 5,0,0,4,0,0,0,0,0
 1006 DATA 255
```

Program III

```
   10 REM Program III
   20 MODE 6
   30 list%=&2000:flag%=&C00
   40 FOR I%=0 TO &7F:flag%?
I%=0:NEXT
   50 Q%=0:L%=1
   60 REPEAT:IF Q%=L% THEN 1
00
   70 PRINT"Old location nu
mber: ";Q%
   80 PRINT"New location nu
mber: ";L%
   90 PROCex:PRINT STRING$(2
2,"-")
  100 INPUT"Enter verb in l
ower case: "vb$:vb$=LEFT$(vb
$,2)
  105 CLS:IF vb$="Q" THEN EN
D
  110 voc$="**NO*SO*EA*WE*UP
*DO*OP*CL"
  120 V%=INSTR(voc$,vb$) DIV
3
  130 ON V% GOSUB 200,200,20
0,200,200,200,210,220 ELSE G
OTO 60
  140 GOTO 60
  145 REM:Subroutines
  200 PROCd(V%):RETURN
  210 PROCop:RETURN
  220 PROCcl:RETURN
  980 END
  990 :
 1000 DEFPROCd(v%)
 1010 Q%=L%
 1020 code%=list%+7*L%
 1030 D%=code%?v%:IF D%=0 PR
OCm(2):ENDPROC
 1040 IF D%>&80 AND flag%?L%
=0 PROCm(?code%):GOTO 1100
 1050 IF D%>&80 D%=D% AND &7
F
 1060 :
 1070 L%=D%
 1100 ENDPROC
 1190 :
 1200 DEFPROCm(m%)
 1210 RESTORE (2000+m%)
 1220 READ m$:PRINT'm$
 1230 ENDPROC
 1235 :
 1300 DEFPROCop
 1400 IF L%<>2  PROCm(3):END
PROC
 1410 IF flag%?2=TRUE PROCm(
6):ENDPROC
 1420 flag%?2=TRUE:flag%?3=T
RUE:PROCm(4)
 1430 ENDPROC
 1435 :
 1440 DEFPROCcl
 1450 IF L%<>2 AND L%<>3 PRO
Cm(3):ENDPROC
 1460 IF flag%?L%=FALSE PROC
m(7):ENDPROC
 1470 flag%?2=FALSE:flag%?3=
FALSE:PROCm(5)
 1480 ENDPROC
 1490 :
 1500 DEFPROCex
 1510 a$="":code%=list%+7*L%
 1520 IF code%?1 THEN a$=a$+
"N "
 1530 IF code%?2 THEN a$=a$+
"S "
 1540 IF code%?3 THEN a$=a$+
"E "
 1550 IF code%?4 THEN a$=a$+
"W "
 1560 IF code%?5 THEN a$=a$+
"U "
 1570 IF code%?6 THEN a$=a$+
"D "
 1580 IF a$="" a$="in no dir
ection"
 1590 PRINT"You see Exits:
";a$
 1600 ENDPROC
 1610 :
 2000 REM:Messages
 2001 DATA Regret door make
impact with            honor
able face!
 2002 DATA No exit this way!
 2003 DATA You can't here
 2004 DATA The door swings o
pen
 2005 DATA You close the doo
r
 2006 DATA "It's open, dummy
!"
 2007 DATA The door IS shut!
```

electron user MAIL ORDER OFFERS electron user MAIL ORDER OFFERS

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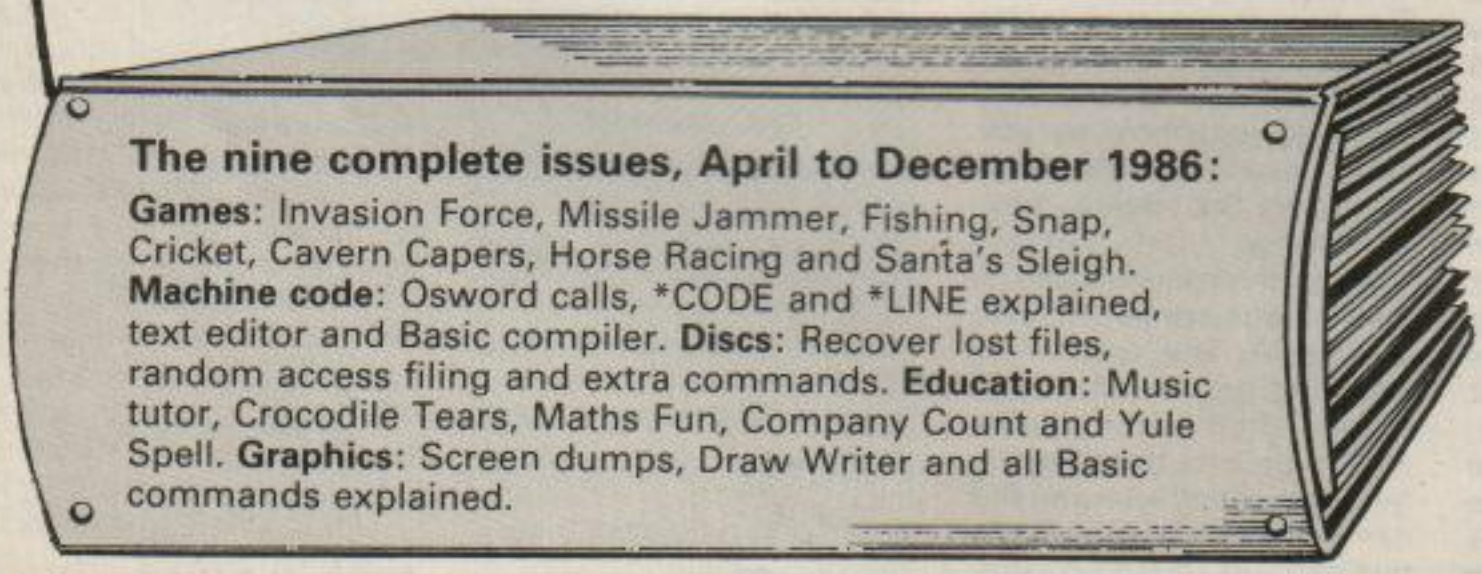

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TO ORDER TURN TO THE FORM ON PAGE 53

10 LINERS

Cassette VERIFY

JUDGING by the letters we receive at *Electron User*, many owners find that after saving even a small program it will not load correctly afterwards.

To put an end to these errors once and for all, Sue Kaiser has written this superb utility to verify that the program on tape is the same as the one in memory.

The program only needs to be run once after switch on or a hard break, since it stores the entire utility in function key one.

To use the routine, simply save the program you are working on, rewind the cassette, press function key one, then press play. The program will be verified with the last version saved automatically, because the filename is read from memory.

If a mismatch is found the error message "Error in verify" will be displayed and the routine will halt.

```
 1 REM Cassette VERIFY
 2 REM by Sue Kaiser
 3 REM (c) Electron User
 4 :
 5 *KEY 1 *OPT1,1|Mn=&3B2
:n$="":REPEAT b=?n:n$=n$+CHR
$b:n=n+1:UNTIL b=0:X=OPENIN
LEFT$(n$,LENn$-1):FOR k=PAGE
 TO TOP-1:IF BGET#X=?k NEXT:
CLOSE#0:ELSE PRINT"Error in
verify.":CLOSE#0|M
```

Spacey names

ONE of the main problems with naming conventions on the Electron's cassette filing system is that it will not allow spaces to form part of a filename.

Previously, this has meant saving your programs with filenames such as MYGAMEONE, which isn't very meaningful. Now Den Miller offers a simple solution with this excellent 10 line utility to include the space character in filenames.

To use it, simply load and run the program then before you save the next program enter *FX 14,4.

Insert the underline character where you want the spaces to appear in the filename and save as normal. For instance:

```
SAVE "MY_GAME_ONE"
```

When the Electron has finished saving enter *FX 13,4 to disable the routine. Programs saved in this way should be reloaded without a name, like:

```
CHAIN
```

and not with:

```
CHAIN "MY GAME ONE"
```

```
 1 REM Spacey names
 2 REM By Den Miller
 3 REM (c) Electron User
 4 *FX13,4
 5 FORG%=0TO2STEP2:P%=&90
0:[OPTG%
 6 PHA:TYA:PHA:LDY#0
 7 .loop LDA&3D2,Y:CMP#95
:BNEout:LDA#32
 8 .out STA&3D2,Y:INY:CPY
#10:BNEloop:PLA:TAY:PLA:RTS
 9 ]:NEXT
10 ?&220=0:?&221=9
```

Automatic Version Numbering

WHEN you are developing a long program, especially in assembly language, one of the main problems is forgetting what you called the last version of the program you saved. Now Julia Forester solves this irritating problem with a simple 10 liner.

The program is split into two halves, one for cassette and one for disc, so you only need to type in the part that applies to your system.

To use either, the number of the latest version must first be poked into location &70 like:

```
?&70=1
```

With the disc version this is only needed once, since the current version number is saved in a file called V each time the program is resaved.

To save the program simply press function key one. To reload the last version saved at any time press function key zero. Cassette users should remember to rewind the tape first.

As with verify, the utility stays in memory until the computer is reset or switched off.

```
 1 REM Auto version numbe
r
 2 REM by Julia Forester
 3 REM Disc version
 4 :
 5 *KEY 0*LOAD V 70|MOSCL
I"LOAD PROG"+STR$(?&70-1)+"
"+STR$~PAGE|MOLD|M
 6 *KEY 1*LOAD V 70|MOSCL
I"SAVE PROG"+STR$(?&70)+" "+
STR$~PAGE+" "+STR$~(TOP-1)|M
?&70=?&70+1|M*SAVE V 70+1|M
 7 REM Cassette version
 8 :
 9 *KEY 0OSCLI"LOAD PROG"
+STR$(?&70-1)+" "+STR$~PAGE|
MOLD|M
10 *KEY 1OSCLI"SAVE PROG"
+STR$(?&70)+" "+STR$~PAGE+"
"+STR$~(TOP-1)|M?&70=?&70+1|
M
```

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Micro Messages

Living in cloud cuckoo land?

NIC Outterside's articles on educational software are interesting. However, the problem does not seem acute for children under 12 years of age. There is masses of software available, some of dubious quality, for all computer systems.

Nor is there a problem for the sixth formers. They can write their own software (my son produced a program to investigate imaginary numbers during his summer holiday which left me gaping), and in most schools, can also use mainframe terminals.

The problem does seem acute in the middle years 12-16. In my children's school the problem has been partially solved by the masters specifying a requirement and getting assistance in writing software from parents.

This is by no means ideal. The school masters are happy to admit they are not computer specialists and the specification frequently leaves much to be desired. Many of the parents use computing in their jobs, but do not possess teaching skills, so there is many a slip.

My children's school does not use Acorn equipment. If I could be assured that there is adequate educational software for this middle group available from Acorn, we might be able to persuade the school governors to change suppliers.

I found Nic's smug statement that "for the first time" he can say all the children in his school have used computers (I am sure his idea of computer literacy and mine are at odds) is a truly devastating comment on the teaching profession – thankfully not true across the board.

After all, the first cheap micro (the Commodore Pet) appeared about 10 years ago and many schools bought or hired one then at least for evaluation purposes.

Surely RML and Nascom machines appeared long before the Sinclair ZX81? My own children's school tells me they already had 25 miscellaneous micros in use by 1981, which was about the time the ZX81 appeared.

They have of course, since then bought many more and standardised on one make. What sort of cloud cuckoo land did Nic's colleague live in? – **R. Hill, Woodford Green, Essex.**

● Your experiences are the exception rather than the rule and many schools did not have micros until well into the 1980s when subsidised BBC Micros were provided – one per school!

Even now, the numbers of micros are very small and often schools (including large comprehensives with 1000 pupils or more) have only a handful of micros.

The situation is improving, but we doubt whether many schools can boast of an average of more than one or two micros per class of 30 pupils.

A comprehensive of 1000 pupils would require 100 micros to achieve a ratio of one micro shared between 10 pupils.

By the time you've bought computers, monitors, printers, disc drives, trolleys to put them on, cupboards to lock them up in, the odd software package and so on, the total cost could be as much as £100,000. This is way beyond the budget of many schools and they simply can't afford it.

Help for Geoff Capes

I THINK your magazine is excellent and it has some brilliant ideas. Many people seem to be having problems with Geoff Capes Strongman. I am actually quite good at it, but had trouble at first. Here are some tips:

First it asks you to share the energy you have among the sections of your body. Put more energy into the hands for car rolling.

*On the side of the screen there is a chart showing effort. Move that nearly to the top using the cursor keys. As soon as a section flashes, use the keys Z, X, * and ? to move the arrow to the flashing section and press Return. It should beep, but it won't if that section's energy isn't high enough.*

I hope this helps. – **Gerald Reeves, Folkstone, Kent.**

Superior service

ABOUT a month ago I was loading Superior Software's Ravenskull when to my horror my tape deck chewed it up beyond repair.

As it was my equipment that broke the cassette I just threw it away. I then wrote to Superior Software asking them to bring out more software on 3.5in disc for the Electron and Plus 3, and also explained what had happened to my tape.

A couple of days later I got a letter from them asking me to return the broken cassette and they would gladly replace it. I wrote back telling them I had thrown it out and about three days later they sent me a brand new cassette of Ravenskull. That is what I call a superior company. – **Paul Keddie, Fife, Scotland.**

Star printer driver

I OWN an Electron and a Star NL-10 dot matrix printer. Until you printed the printer driver for View in the August 1986 issue of Electron User, *life with my printer was quite boring.*

This has now been knocked off its perch as the most useful utility printed in your magazine by the new Driver II in the August 1987 issue.

This is far better than the previous printer driver because an unlimited (within reason) number of different type styles can be used. I would like to congratulate Julie Boswell for writing it.

Could you please inform cassette users that they must type:

```
PRINTER DRIVER
```

to load the driver created by the program into View.

I have a problem when using Driver II. When printing out letters the printer advances the paper one inch too far, even when set with

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◀ From Page 47

the DIP switches to use 11 inch paper.

This only happens when using this driver so could you please tell me what I am doing wrong as I have checked my listing and have not found any mistakes.

Table I shows a list of type styles available together with the codes needed to enter them into the printer driver. These should work with any Epson compatible printer. I'm sure printer owners will find this most useful.

Finally, would it be possible to write a Get it Right checksum program like the one used in The Micro User? – **Paul Mama, Middleton, Manchester.**

● The page length problem may be caused by some of the type styles taking up more than one line on the page. If double height text is printed an extra line of paper is required for every line on screen. This will mean View miscalculates the length of the page.

You can correct this by setting the page length within View using the stored command PL. However, it seems a bit of a hit and miss affair whether you get it right – can any readers come up with a more satisfactory solution?

We are looking into the possibility of a checksum program. The BBC Micro version will run on the Electron providing the listing being checksummed is fairly short. Unfortunately, the routine runs out of memory with larger programs (when it is most needed), especially if you have a Plus 3 disc drive.

ALL programs printed in this issue are exact reproduction of listings taken from running programs which have been thoroughly tested.

However on the very rare occasions that mistakes may occur corrections will be published as a matter of urgency. Should you encounter error messages when you type in a program they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

No joy with Plus 3

I HAVE the April 1985 Electron User *cassette. On it there is a program called Joyplus, designed so any software other than Acornsoft's can be used with the Plus 1 and joysticks.*

I now have a Plus 3 disc drive and cannot succeed in making the program work from disc. I have transferred the program to disc, but it will not run.

I have eliminated one problem by changing the Mode 1 in line 70 to Mode 4. By doing this I then get an error in line 80 and the program will not run. Do you have any ideas on this?

One other question: I have Mini Office on cassette and cannot succeed in transferring it to disc. Do you supply this software on 3.5in disc for the Electron? If so, how much does it cost? If not, is there any way of transferring it to disc? – **S.J.Thomson, Reading, Berks.**

● Joyplus was written with a tape based Electron in mind. In fact, the Plus 3 was not available when the program was written and we're not sure why it won't work. It does however, work with ACP's Plus 4 so it could be a memory clash problem.

We thought it was about time we updated this excellent utility and you'll find a completely rewritten and much improved joystick utility in this issue. This will work with all versions of the Electron and disc filing system.

This will enable you to use most magazine listings and some commercial software that is designed for keyboard only, with a Plus 1 and joystick.

Unfortunately, Mini Office is not available on 3.5in disc for the Electron and it cannot be transferred from tape because of the heavy protection.

However, the BBC Micro version on 5.25in disc does work with Slogger's SEDFS and ACP's Plus 4 if you don't mind it trying to print the odd Mode 7 control code on the screen (which does no harm by the way). Watch out if you have ACP's ADT rom – you'll need to *UNPLUG it before !BOOTing Mini Office.

Compatible Plus 3

CONGRATULATIONS on an excellent magazine, especially the reviews and type-in programs, and of course, Micro Messages. But alas, I have a problem. I cannot get a Plus 3 anywhere.

I have no disc expansion at the moment and don't mind if I just get a Plus 3 compatible drive. Is the Rombox Plus from Slogger fully compatible with the Plus 1 and if so, can you recommend an interface and 3.5in drive? – **Zachary Tullett, Bognor Regis, West Sussex.**

● All the Plus 3s Acorn made have now been sold and no more are available. However, Advanced Computer Products has obtained permission from Acorn to produce its own version of the Plus 3 and this will be on sale for £99.

ACP has got the source code for the ADFS and will be tidying up some of the bugs and squeezing in some utilities as well, so it should be good.

Which DFS?

HAVING had an Electron now for four years along with a Rombox and Amstrad DMP3000 printer, I wonder if you could advise me as to my next move?

I would love to upgrade my micro by adding a disc system, but am not convinced it would be worth the cost. If I did, could you

Style	On	Off
Itallics	27,52	27,53
NLQ	27,120,49	27,120,48
Elite	27,77	27,80
Condensed	27,15	18
Double width	27,87,49	27,87,48
Proportional	27,112,49	27,112,48
Emphasized	27,69	27,70
Bold	27,71	27,72
Underlined	27,45,49	27,45,48
Superscript	27,83,48	27,84
Subscript	27,83,49	27,84
Double width/height	27,104,1	27,104,0
Quad width/height	27,104,2	27,104,0
UK characters	27,82,3	27,82,0

Table I: Printer driver codes

advise me which disc filing system to go for?

If I was going to upgrade to another computer system I would obviously be interested in the BBC series, so could you also advise me on the the best buy – the Master or Master Compact. – **M. Roberts, Baor.**

● The cheapest disc system is ACP's Advanced Plus 3 – it's so new we haven't even seen one yet, but it should be good.

The Master is probably the better choice of the two micros you mention as it is far more flexible and it has a far wider scope for expansion.

Our advice however, would be to hang on to your Electron for another couple of years and keep your eye on the Archimedes. At the moment there isn't much software or hardware available for it, but once it gets established we'll see some amazing packages.

Your Plus 3 ADFS discs will work perfectly in the Archimedes and it will even load and run many *Electron User* program listings, machine code included provided you load the 6502 emulator.

Hints and tips wanted

THANK you very much for publishing the software chart, it has made the magazine even better. But please could we see a space devoted to hints and tips for games?

Do you or any readers know of a good software library for the Electron? I know of one, but it does not have any up-to-date games. – **Lee Harland, Gilesgate, Durham.**

● Arcade Corner is devoted entirely to hints, tips, pokes and cheat modes for arcade games and Pendragon provides help for those stuck in adventure games.

We haven't heard of any software libraries specialising in Electron software.

More ram-better graphics?

ON hearing of the Master Ram Board and its 64k from Slogger, I was amazed and immediately set about saving my spare cash for one.

Does this add-on mean that games for the Electron could match the quality and graphics of the Commodore 64, and if so, then why aren't there any of the new games out already? – **Kevin Etheridge, Cheltenham, Glos.**

● The number of screen modes, their resolution and the number of colours available will not be changed by adding more ram.

However, the more memory the programmer has available to him, the larger and more complex the games he can write and the greater the variety of graphics he can incorporate. So, more memory does in fact mean better quality games can be written.

Unfortunately, software houses are still writing software designed to run on the standard Electron and do not provide enhanced versions for the much faster Turbo and Master Ram Board versions.

If there is sufficient demand for Turbo or 64k games the software houses will respond by producing the software. If you want better games then write to the software houses and let them know.

Double trouble

I HAVE just bought a new printer – a Micro-P Shinwa CPA-80 – and it's working perfectly except for the graphics. With the enlarged screen dump from Slogger's Stargraph it will only print three-quarters of the width of the paper recommended for the machine.

What I think is happening is that the printer when switched on is putting itself into double density mode. Please could you tell me which code you enter for the normal density mode as the manual is very confusing.

Could you also tell me which FX code switches off line feeds as it doesn't tell me how to do this in the manual.

Finally, is there a code to switch off a specific rom in the Rombox Plus? I have been told Slogger's Elkman does this, but £9.95 seems a lot to pay for just this utility. – **G. Wintle, Cheltenham, Glos.**

● We haven't had any experience of your printer so we must turn this problem over to the readers and ask them for a solution. Can anyone help?

You can switch off line feeds with *FX6,10 and turn them back on with *FX6,0.

Elkman is a complete toolkit rom which will list the roms present, turn them off and on, dump memory in hex and Ascii, load and save rom images to sideways ram, disassemble machine code programs and much more. At £9.95 it's a bargain and well worth considering.

However, if all you wish to do is turn a rom off, try poking a zero into the position occupied by the rom in the operating system's rom table starting at &2A0. For instance, if your rom is in socket 5, enter:

```
?&2A5=0
```

to switch it off.

Record breaking letters

IN Tynesoft's Commonwealth games I found something I would like to know how to produce. If you break the world record in the weight lifting event you are informed in really massive letters NEW RECORD.

Please could you tell me how to produce letters that size as they would be useful for the darts scoreboard I have produced on my Electron.

Big letters would make it much easier for players to see their score. Normal or double height letters are too small when the television is eight feet away. – **Michael Severn, Preston, Lancs.**

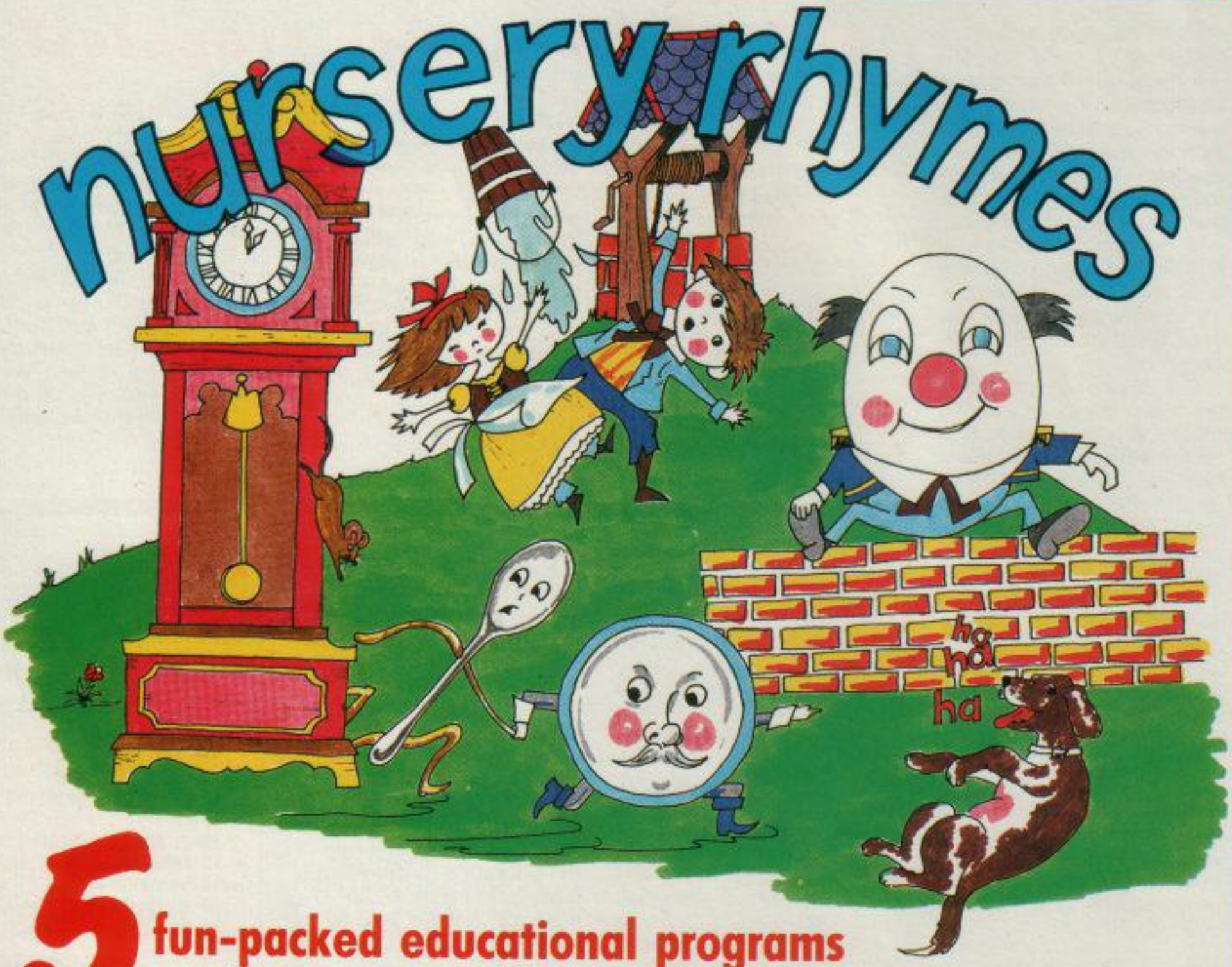
● Here's a short routine to print extra large text:

```
10 REM Big Letters
20 MODE 6
30 PRINT
40 INPUT 'Enter MODE:"M%
50 MODE M%
60 PRINT
70 INPUT 'Type in a short
word:"word$
80 PROCbig(0,10,1,word$)
90 END
100
110 DEF PROCbig(x,y,c,m$)
120 COLOUR 128+c
130 FOR i=1 TO LEN m$
140 ?&70=ASC(MID$(m$,i))
150 A%=10:X%=&70:Y%=0
160 CALL &FFF1
170 FOR j=0 TO 7
180 PRINTTAB(x+i*8-8,y+j);
190 FOR k=7 TO 0 STEP -1
200 IF j?&71 AND 2^k VDU 3
2 ELSE VDU 9
210 NEXT
220 NEXT
230 NEXT
240 COLOUR 128
250 ENDPROC
```

To print a short word in large text call PROCbig(x,y,c,m$) where *x,y* are the coordinates to print at, *c* is the colour and *m$* is the string of characters.

It works by asking the operating system to get the character definition data for each character using osword 10. It then prints a coloured space for each bit set in each of the eight data bytes.

nursery rhymes



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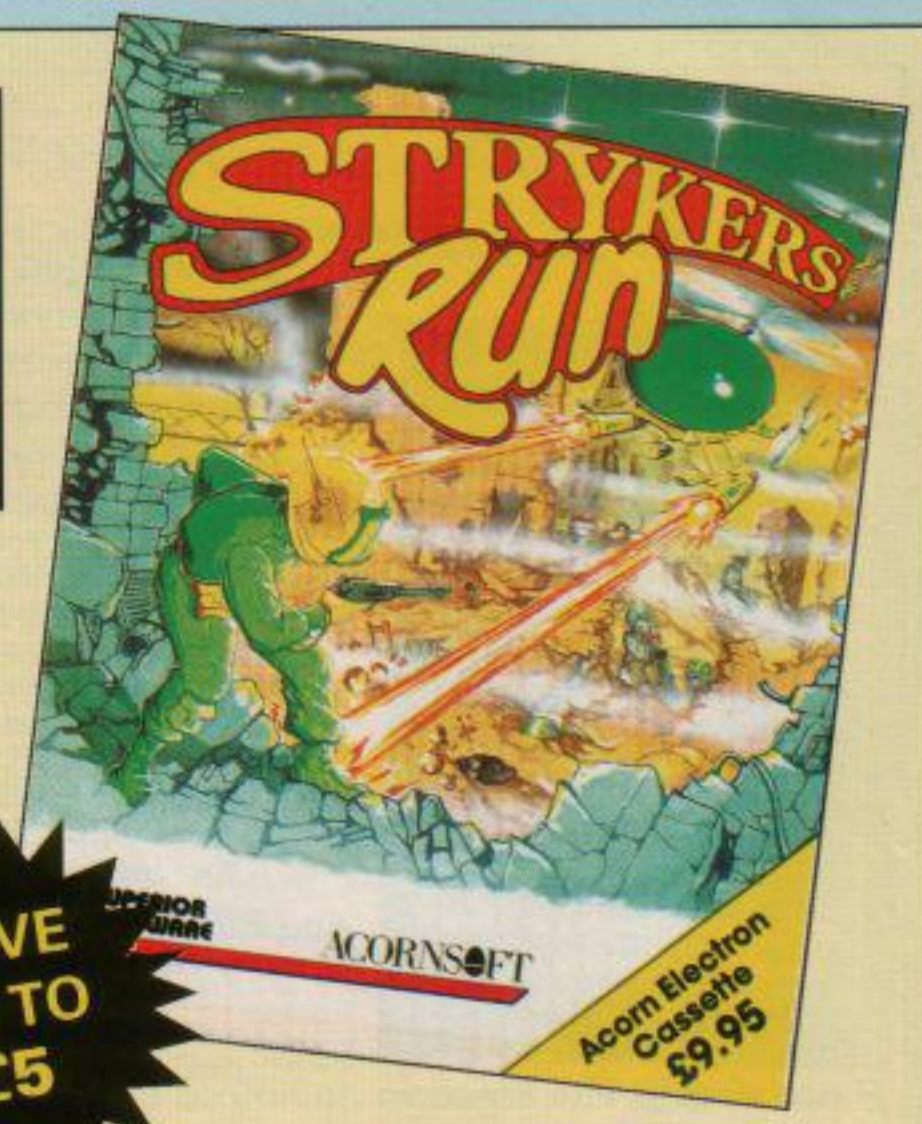
Get Stryker's Run – it's a stunner!



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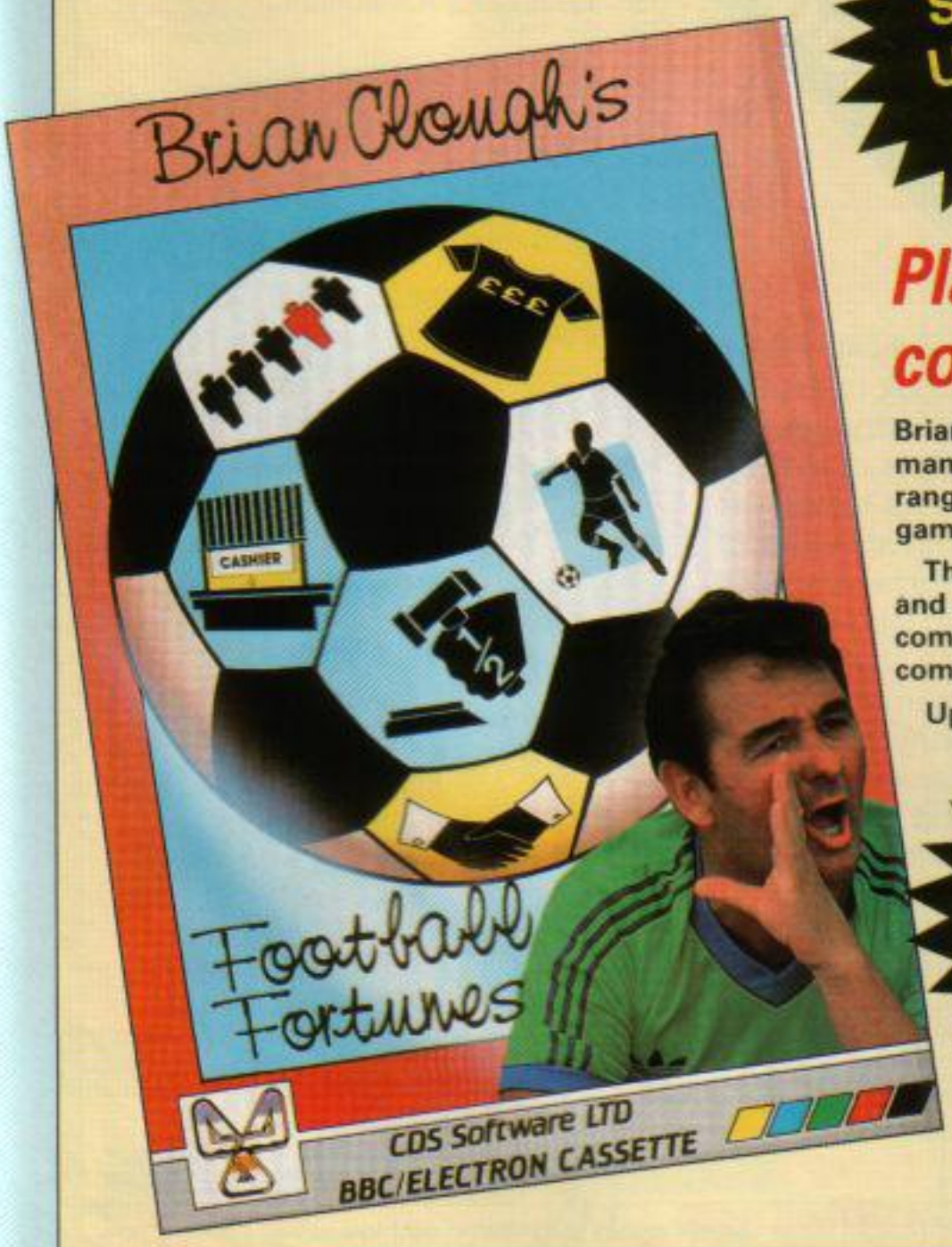

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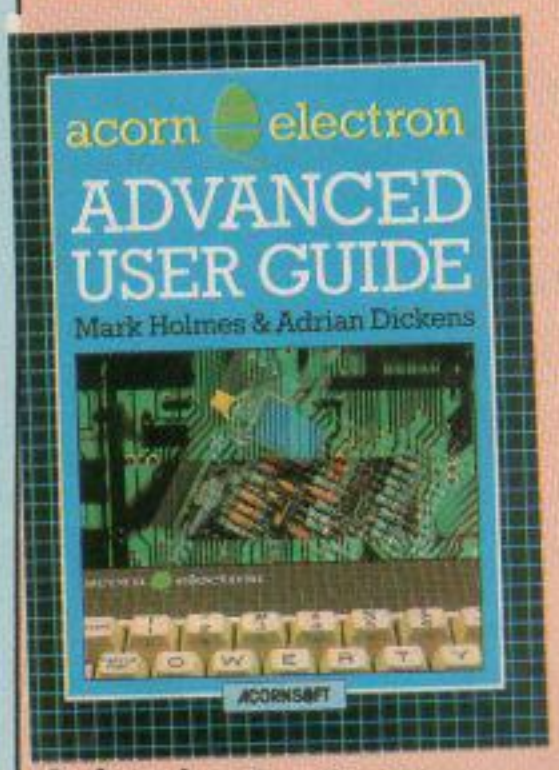
This is THE ultimate guide to the Electron!



This detailed guide to the Electron's operating system is a must for every serious Electron user. In its information packed pages you'll find:

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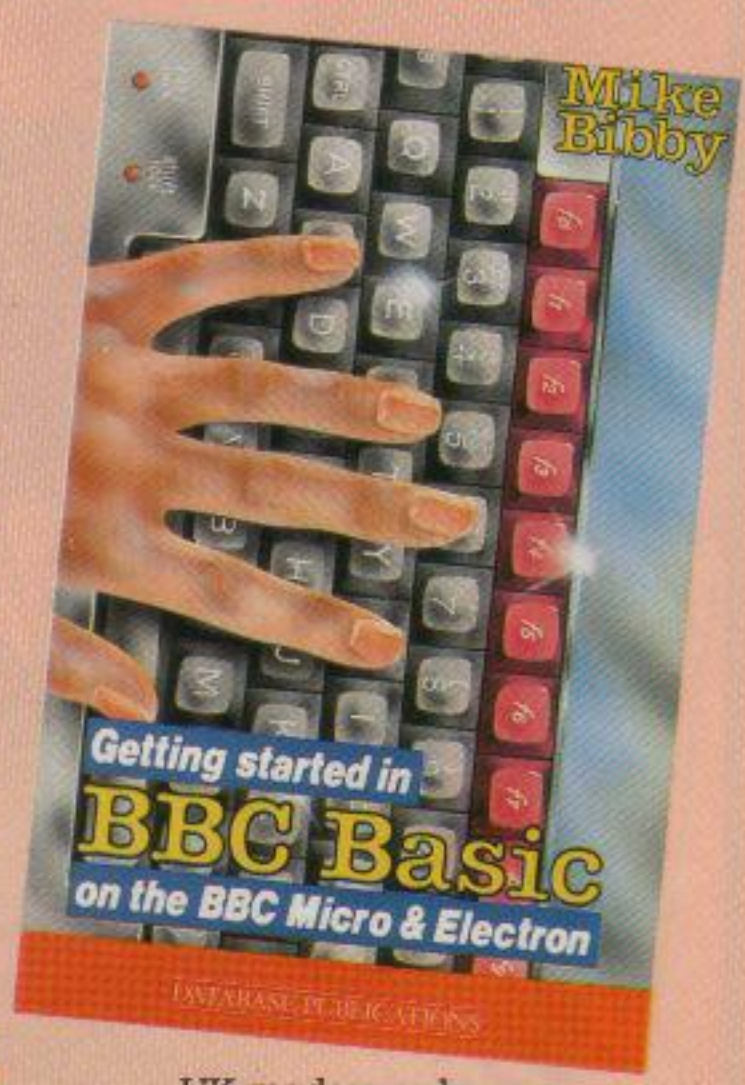

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An alternative to our AED(05) for Plus 3 and ASR users. This optional alternative DFS is designed for use in Sideways RAM (ASR) and allows the user to operate a disc filing system **&Eøø** when using the Plus 3 (in ADFS page would normally be **&1Døø**). The DFS is simply loaded using the software supplied with the ASR from disc. (optional upgrade for existing AED users £9.50 on return of original EPROM) (3½" ADFS disc + manual)

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New Hi-tech cartridge (normal size) containing an incredible 256k of S.ways RAM although it could be used to store many pages of s.ways ROM images its primary and best use is as a RAM Disc supported by our advanced 1770DFS (Master/ADM or Electron ADE are now upgraded to access the 256k in AQR. Now databases (i.e. Viewstore) can perform at breathtaking speed (over twice as fast as some other 1 Meg Silicon Discs) and animation with up to 25 screens becomes a reality. Price must reflect real value for money and package prices for AQR and ADM/E are available at £99.95 (existing ROMS may be upgraded when purchasing AQR for £5

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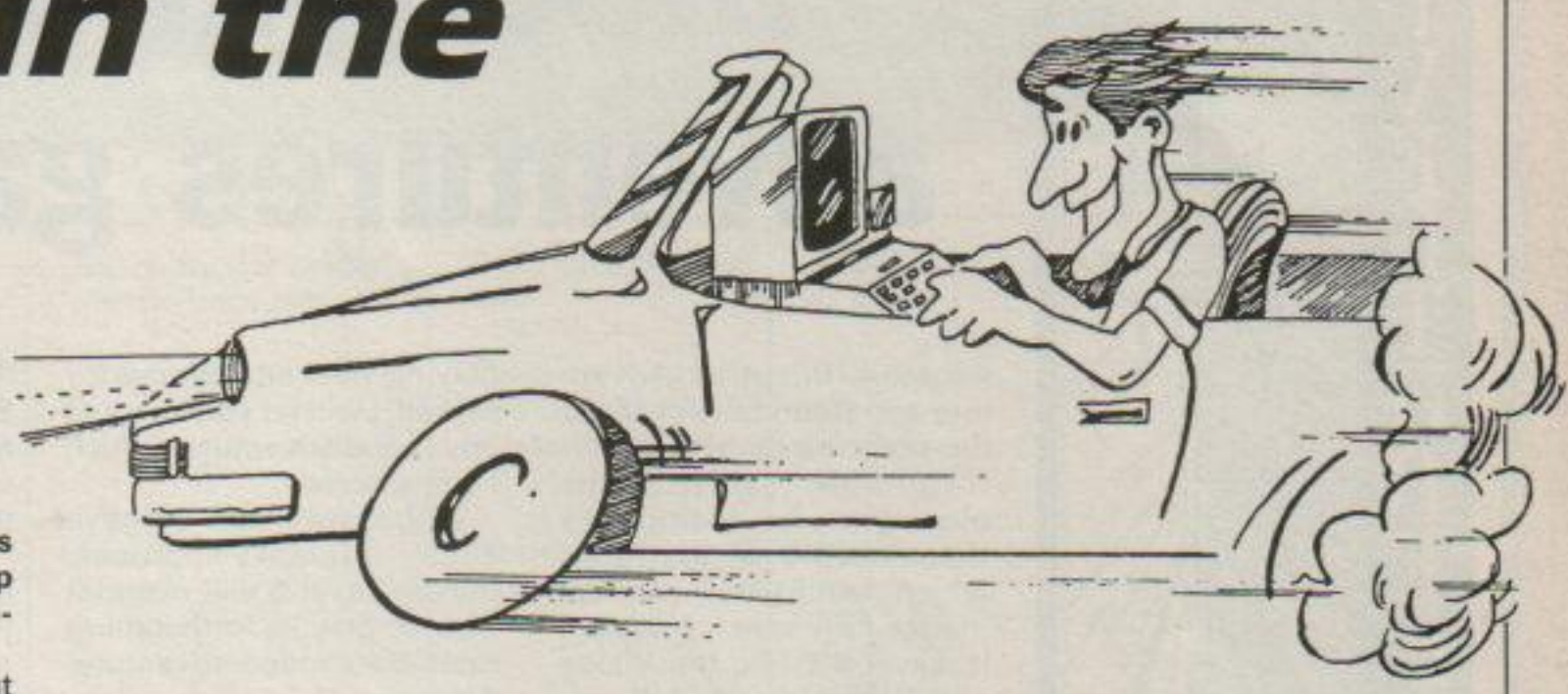


BARRY WOOD shows how to keep your motoring bills down

THIS month's program is designed to help you keep track of your petrol consumption.

It enables you to work out your current consumption in miles per gallon and compare it with previous values.

The current and the last nine values calculated are displayed on an easy-to-read bar chart.

By keeping track of the petrol used you can see whether the engine requires tuning – consumption will increase as the car approaches its next service.

If you reguarly tow a caravan, this will also show up on the chart and you can easily see the effect of the extra weight.

Enter and run the program. You'll be asked if you wish to load the previous results. The first time you run the program the answer will of course be N.

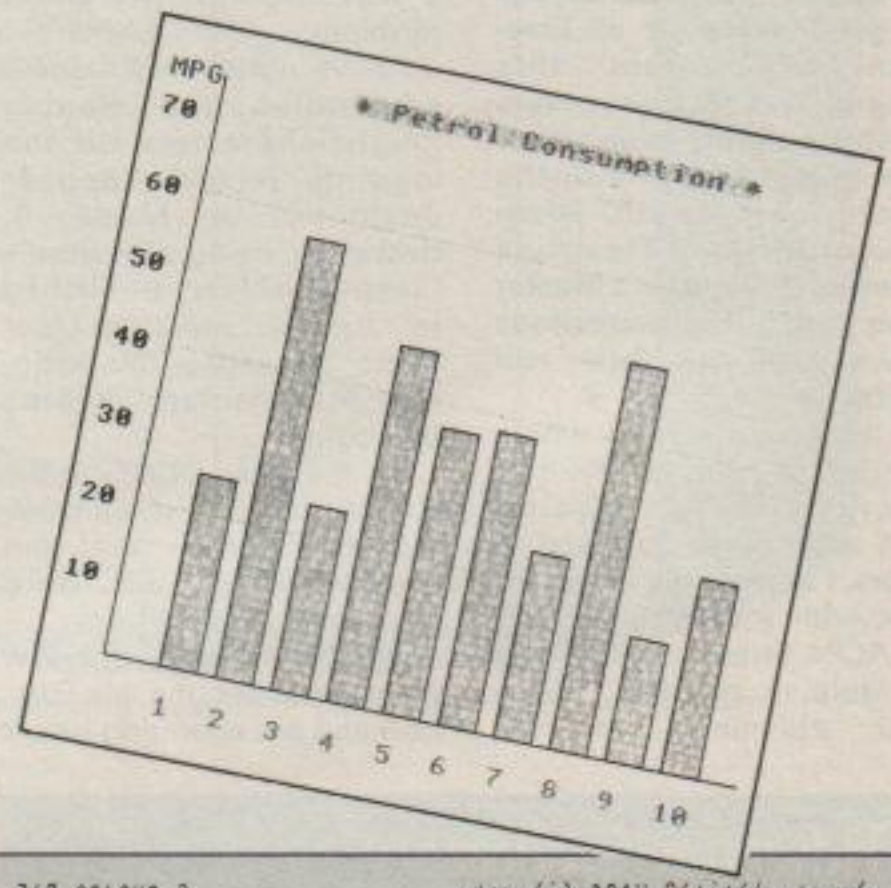
Next you'll be asked if you wish to calculate your current petrol consumption. Press Y here.

Enter the number of miles covered at the first prompt and the amount of petrol used at the second.

Many petrol pumps deliver petrol in litres instead of gallons. If you tag an L on to the end of the number entered for the petrol it will be assumed to be litres, and is converted to gallons before calculating and printing the mpg.

After displaying this a bar chart is drawn showing the current mpg first (on the left) followed by the previous nine readings.

You can save the bar chart data to tape or disc.




```
   10 REM MPG Calculator
   20 REM By Barry Wood
   30 REM (c) Electron User
   40 MODE 1:*FX16
   50 DIM mpg(10)
   60 t$=CHR$(17)+CHR$(129)+
"* Petrol Consumption *"+CHR
$(17)+CHR$(128)
   70 PRINT't$'
   80
   90 REM Load mpg's
  100 COLOUR 2
  110 PRINT"Load previous mp
g's?";
  120 IF INSTR("Yy",GET$) EL
SE 230
  130 MODE 6
  140 file=OPENIN "MPGdata"
  150 FOR i=1 TO 10
  160 INPUT #file,mpg(i)
  170 NEXT
  180 CLOSE #file
  190 MODE 1
  200 PRINT't$'
  210
  220 REM New mpg
  230 COLOUR 3
  240 PRINT"Calculate new
MPG?";
  250 IF INSTR("Yy",GET$) EL
SE 400
  260 FOR i=10 TO 2 STEP -1
  270 mpg(i)=mpg(i-1)
  280 NEXT
  290 INPUT"How many miles
";m
  300 INPUT"How much petrol
";p$
  310 p=VAL p$
  320 IF (ASC(RIGHT$(p$,1))O
R 32)=ASC"l" p=p/4.5
  330 mpg(1)=INT(m/p)
  340 COLOUR 2
  350 PRINT"MPG = ";mpg(1)
  360 COLOUR 1
  370 PRINT"Hit a key...";
  380 G%=GET
  390
  400 REM Bar chart
  410 CLS:COLOUR 2
  420 PRINT"MPG"TAB(10)t$
  430 y=12
  440 VDU29,96;76;
  450 FOR i=1 TO 10
  460 IF mpg(i) ELSE 520
  470 GCOL 1,1
  480 MOVE 0,y*i*10:PLOT 21,
1200,y*i*10
  490 MOVE 96*i,y*mpg(i):MOV
E 96*i+64,y*mpg(i):PLOT 85,9
6*i,4:PLOT 85,96*i+64,4
  500 GCOL 0,3
  510 MOVE 96*i,4:DRAW 96*i,
y*mpg(i):DRAW 96*i+64,y*mpg(
i):DRAW 96*i+64,4
  520 VDU 5:MOVE -96,12+y*i*
10:PRINT;i*10:VDU4
  530 PRINT TAB(3+i*3,31);i;
  540 NEXT
  550 MOVE 0,900:DRAW 0,0:DR
AW 1200,0
  560 G%=GET
  570
  580 REM Save mpg's
  590 MODE 6
  600 PRINT"Save mpg's?";
  610 IF INSTR("Yy",GET$) EL
SE END
  620 file=OPENOUT "MPGdata"
  630 FOR i=1 TO 10
  640 PRINT #file,mpg(i)
  650 NEXT
  660 CLOSE #file
```

DISCOVERED – adventures galore!

MY ravens bring me scrolls of good news for all Electron adventurers this month. Two regular readers of this column have spent the past three months testing over 80 BBC Micro adventures on Electrons fitted with Slogger's Master Ram Board. The marvellous news is all but three run perfectly.

This opens up the whole range of Level 9 and Acornsoft cassette-based text adventures to Electron users. I am reliably informed that with a Slogger SEDFS or ACP4 fitted you will also be able to run BBC Micro disc classics such as Acheton, Egyptian Adventure and Quondam. In short, the sky's the limit!

The only real fly in the ointment is Melbourne House's Lord of the Rings which would not run, no matter how much I coaxed it. Level 9's Eric the Viking and Emerald Isle will run without graphics.

I imagine this is because they use Mode 7 to create the pictures – though Slogger informs me there is even a way around this small problem.

I have noticed with some adventures the double height characters on the loading screens appear unsightly in Mode 6. However, using D.Aulton's Clean-up utility, published in July's *Electron User* Micro Messages, this insignificant problem is also overcome.

So for only £49.95 – the cost of only five good quality adventures – you can have almost total BBC Micro adventure compatibility.

Needless to say I am now a proud owner of a 64k Electron and am spending hours playing BBC adventures for myself. I will let you know of any rogue adventures which I come across.

Who knows, now we have such memory power, maybe Level 9 will even let us in to play its forthcoming multi-user mega-adventure, Avalon.

While riding back from a tournament last week I tuned my Chargerola into an interesting programme on Radio 4. I don't know whether you caught it, but there was a most enthralling interview with adventure writer, Anita Sinclair, in which she demonstrated the delights of adventuring to an unenlightened reporter.

The interview contained a preview of a new interactive adventure called Guild of Thieves. The version I heard involved the use of a voice synthesiser which supplanted the usual textual response.

I don't know whether Guild of Thieves is yet available for the Electron, but it is surely only a matter of time before we are holding conversations with our micros.

Further superb news is that Robico's wonderful graphic adventure, The Hunt (Search for Shauna) is now out for the Electron.

It is a superbly constructed sci-fi escapade in the tradition of Enthar Seven, with graphics which surpass those of The Lost Crystal.

The packaging is an interesting deviation for Robico and must be seen to be appreciated. I have a copy of this game for the first person to send me the secret of the hidden access in the Lost Crystal.

James Elson writes to say he has completed Sphinx Adventure in 248 moves, making regular use of the Mithril ring. Well done James. There is a copy of Special Operations for anyone who can send me a solution of this game in less than 240 moves.

Finally, will Georgina Corrick who wrote asking for details concerning the adventure database, please let me have her address so I can forward the necessary information.

Next month I will announce the winner of the Home-penned adventure competition. So until the buffers run dry, happy adventuring.

Adventurer's Glossary

Due to popular demand I am beginning this month to serialise an Adventurer's Dictionary which should prove helpful to novice and expert alike.

Alcove Always worth EXAMining and sometimes for dreaming in or maybe used for transportation purposes.

Ale Always SAVE your position before attempting to drink this as it could put paid to your adventuring.

Amethyst Almost always a treasure.

Apple Eat it – it could have transporting effects, but beware, it could also be poisoned.

Arquebus An ancient firearm – take care how you fire it.

Armour Usually worn for protection, though in the case of Red Moon, ensure you are wearing the padding first. Occasionally used for hiding something in.

Axe Invariably a weapon, though may also be used for chopping wood.

(To be continued)

Problems Solved

This month I seem to have had an inrush of pleas for help with various Melbourne House adventures. To appease all those readers threatening odd forms of suicide or GBH on my royal personage I will dedicate the section this month, to those games.

The following back issues of *Electron User* will furnish readers with reams of help with **Terrormolinos**: February, May, July, August, September, October and November 1986.

Jonathan Reeve cannot find the tickets for the holiday at the start of Terrormolinos. If you open the drawer in Beryl's room and EXAM the brochure, those elusive tickets should come to light.

Richard Bowler is stuck a few moves further on in the same game. The exact words you need to say to get into the taxi are HIRE TAXI.

Helen Loone has been a little more successful, but cannot discover which items to take to the beach. If my memory serves me well,

Location guide to Savage Island Part Three

Location	Description	Visible objects	Exits	Result
23	Beach by the ocean visible from cliff	Raft, cave in cliff	GO RAFT GO CAVE	Raft 24
24	In a cave	Cave drawings, opening in roof, stalactite	SOUTH smash stalactite GO CREVICE	23 25
25	In a metal lined tunnel	None	SOUTH EAST WEST NORTH	24 26 27 28
26	In a metal room	Sealed display case, containing cavemen	WEST	25
27	In a metal room	Sealed display case containing tyranosaurus rex	EAST	25
28	In a metal lined tunnel	None	SOUTH EAST WEST	25 29 31
29	Dimly lit rock room	None	SOUTH WEST	30 28
30	Rock room	Alien machinery	NORTH	29
31	Metal room	Force field control console	EAST GO FORCE FIELD	28 32
32	Small metal room	Force field	GO FORCE FIELD	31

Parts 1 and 2 of our guide to Savage Island appeared in the August and September issues of Electron User. *Next month: Part 4*

you need to wear the trunks and hanky and take the harpoon gun and camera.

For the help I am about to offer with **Dodgy Geezers**, I am indebted to the marvellous set of hints supplied by one of my knights, Sir John Tipper.

Paul Evans, Andrew Spratling and Iain McFee are all stuck in part one of the game. Examine all the Wanted posters to establish the characters of the probable members of your gang.

You should then go about enlisting the help of Tricks, Soapy and Mr Video. However, the other undesirables also have important roles to play in supplying you with information.

Little Ken will give you an important tip for the dog race. You should pass this on to Tweedle who will split his winnings with you when you meet him at the construction site. The dobermans should also be put to sleep if you want to avoid those sharp teeth.

Stephen Humphrey asks where he can find the flask in **Denis through the Drinking Glass**. Depending upon which version of this game you have, you will find that important drink either in the bookcase or the chamber pot in the master bedroom.

Martin Johnson points out that part of the map of **Hampstead** published in the March 1987 issue of my column shows the screwdriver in the Toy Department, when we all know it is really in the Furniture Department.

I have had the monk flogged who made that transcription error, and executed the scribe who wrote a Cleaning in the jungle, in my Myorem maze map.

And for the cheats out there: To list the verbs, puzzles and room descriptions in any Melbourne House adventure, the following decompiler should be loaded upon QUITing the adventure. It might be a good idea to enable your printer first of all.

```
    0 CLS:GOTO31000
31000 VDU14
31010 INPUT"ST",ST$
31020 INPUT"EN",EN$
31030 ST=EVAL(ST$):EN=EVAL
(EN$)
31040 FOR AD=ST TO EN
31050 VA=?AD
31060 IF VA<65 OR VA>90 AN
D VA<97 AND VA>122 THEN VA
=46
31070 PRINT CHR$(VA);
31080 NEXT
```

You will need to enter the start and end addresses in hexadecimal when prompted by the program.

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Readers' Hall of Fame

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Enthar Seven** (continued from last month) – **The Boss

You now have a choice of the five remaining sectors of the adventure and for simplicity I next tackled sector six.

Equip yourself with the diamond, goggles (worn) and gloves (worn). Enter the Teleport cubicle and press S6. You will arrive in a desolate wasteland with evidence that some great catastrophe has occurred.

Exploration WEST will unearth the Teleport cubicle, and journeying EAST you will soon find a corrugated iron shed with an armoured glass window in its eastern wall. You should now realise the purpose for that diamond. Inside the shed is an oxygen cylinder which will prove priceless at a later stage of the game.

Back at the start, walking NORTH will take you to a sign warning of high levels of radiation. I soon discovered the ensuing area was a lethal maze in which it was impossible to SAVE your position.

I therefore decided to @BUFFSAVE at the Sign and used the Explore and die technique to methodically map an area of over 35 locations. A Geiger Counter, N, NW of the sign, helped me chart the region with a touch more safety and speed.

A copper coin is soon discovered, which will be needed when you reach sector seven. You will also meet two mutated life forms which are both deadly.

A heavy boulder can be used to crush the first – though take care how you collect it – and the goggles must be worn before encountering the vitriol-spitting lizard.

After dying of radiation poisoning a few dozen times you should eventually discover a path out of the radiation field.

Exploration beyond the Tor will lead you to a beautiful blue flower in a large field. The salt lake bed must also be negotiated if you wish to retrieve the small oar and hammer. Remember that H2SO4 is not for drinking.

A teleport cubicle to the EAST of the Tor will guarantee you safe passage back to the command centre.

The Lost Crystal** (continued from last month) – **Robert Henderson

When part four starts you will be in total darkness and without your possessions. Your first priority is to find a light source and the only one available is Merlin's luminous gem.

Go and get the sword from under the black crystal room, and the stake at the end of the gloomy corridor. Open the vampire's coffin and kill him with the stake.

You can now free Merlin. Open the dungeon door, let Merlin wander to the coffin, then tell him to follow you.

Return to the dungeon, retrieve the hammer and bash the grating. Climb through and go back to the temple where you will need to kill the hydra again with the sword.

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Super switchback

PAUL BURTON shows how to produce pop-up menus

A FEW months ago while writing a simple CAD system, I needed some form of pop-up menu. The program that created these had to save the area of screen where the menu was to appear, then display the options and wait for a keypress.

Once an option had been chosen, the routine had to restore what was previously where the menu was. This is achieved by saving part of the screen to memory and loading it back again afterwards.

The main problem encountered was that it was extremely slow in Basic to transfer a large chunk of the screen to another part of memory. So the routine had to be written in machine code.

The resulting program is shown in Listing I. It's not a complete program, just the procedures required to implement the pop-up menus and is intended to be tacked on to the end of your own programs.

Listing II is a short demonstration program. Enter this and add Listing I to the end to produce a complete program.

When run, a series of random lines will be drawn on the screen and you'll be presented with a menu. Choose an option by highlighting it with the cursor keys and press Return to confirm your choice.

The random lines are there simply to show how the routine restores the screen menu after removing the menu. You could in fact, have any picture or text on-screen.

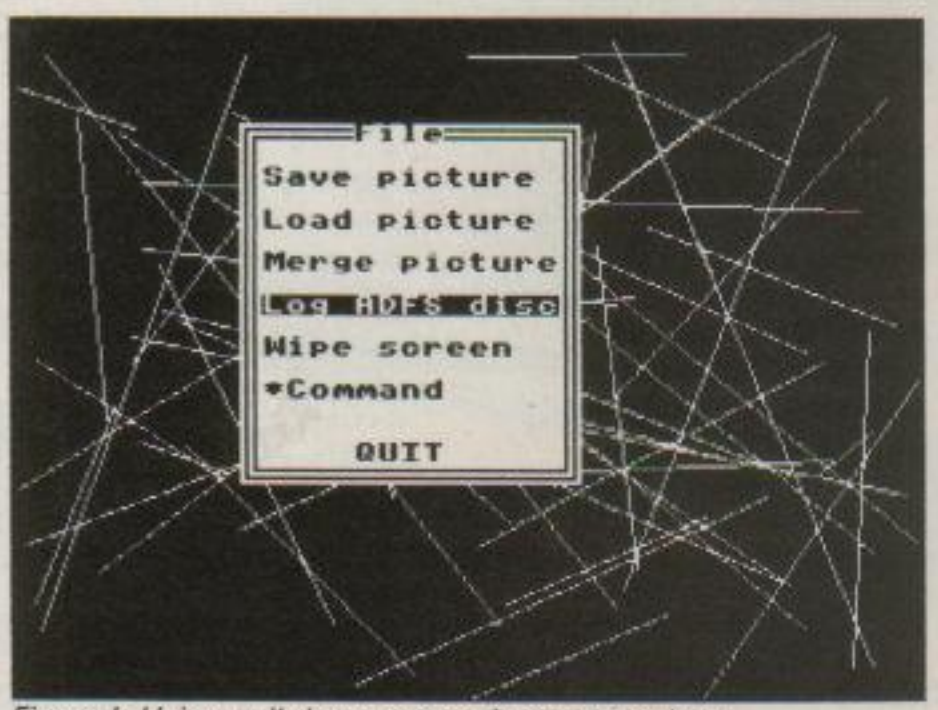

Figure I: Using pull-down menus in an art package

As you can see from Listing II, a menu can be placed anywhere on the screen using the function FNmenu. To place one at *x,y* with *n* options and title *t$* you use:

```
O%=FNmenu(x,y,n,t$)
```

The menu options are held in the array *menu$()*, defined in PROCinitialise. After an option has been chosen, *O%* will contain the number of the item chosen. However, there are some cases in which O% can contain a negative number: This indicates an error. The error codes are shown in Table I.

The function FNmenu uses the procedure PROCwindow, which allows you to load or save a defined area of the screen to any other place in memory:

```
PROCwindow(x1,y1,x2,y2,safe,space,do)
```

where *x,y1* and *x2,y2* are the coordinates of the top-left and the bottom-right of the window to be saved and *safe* is the address the screen memory is to be moved to.

PROCinitialise uses DIM to reserve 5000 bytes which should be sufficient for most applications. If you only have small menus, you can reduce this.

The last parameter in the procedure call, *do* indicates whether to save or restore the memory.

The function FNaddress(x,y) calculates the screen address of any point on the screen. As it stands the utility works in Mode 4, however, with a little modification to line 9330 it can be made to work in any graphic mode. Table II shows the changes necessary. ■

Value of O%	Error
–1	Menu entries too long.
–2	Too many entries.
–3	Window too large.

Table I: Errors reported by FNmenu

Mode	New line 9330
0	=&3000+(x*8)+(y*640)
1	=&3000+(x*16)+(y*640)
2	=&3000+(x*32)+(y*640)
5	=&5800+(x*16)+(y*320)

Table II: Alternative lines for different modes

Listing II

```
  10 REM Menu Demo
  20 MODE 4
  30 PROCinitialise
  40 COLOUR 129:CLS
  50 GCOL 0,0
  60 FOR i=1 TO 50
  70 MOVE RND(1280),RND(1024)
  80 DRAW RND(1280),RND(1024)
  90 NEXT
 100 menu$(1)="Apples"
 110 menu$(2)="Oranges"
 120 menu$(3)="Pears"
 130 menu$(4)="Plums"
 140 O%=FNmenu(10,5,4,"Pick a Fruit")
 150 PRINT TAB(10,25)"You picked "menu$(O%)
 160 *FX21
 170 *FX4
 180 END
```

Listing I

```
 9000 DEF PROCinitialise
 9010 DIM safe 5000,menu$(20)
 9020 VDU23,224,0,0,255,0,0,255,0,0
 9030 VDU23,225,36,36,36,36,36,36,36,36
 9040 VDU23,226,0,0,63,32,32,39,36,36
 9050 VDU23,227,0,0,252,4,4,
```

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```
228,36,36
 9060 VDU23,228,36,36,39,32,
32,63,0,0
 9070 VDU23,229,36,36,228,4,
4,252,0,0
 9080 FOR pass=0 TO 2 STEP 2
 9090 P%=&900
 9100 [OPTpass
 9110 LDA &74:STA &70:LDA &7
5:STA &71
 9120 .beg
 9130 LDY #0:STY &7C:STY &7D
 9140 .LL
 9150 LDX &7E:DEX:BEQ write
 9160 DEX:BEQ read
 9170 .ret
 9180 INC &70:BNE a:INC &71:
.a
 9190 INC &72:BNE b:INC &73:
.b
 9200 INC &7C:BNE c:INC &7D:
.c
 9210 LDA &7C:CMP &78:BNE LL
 9220 LDA &7D:CMP &79:BNE LL
 9230 INC &80:LDA &80:CMP &7
F:BEQ er
 9240 CLC:LDA &70:ADC &7A:ST
A &70:LDA &71:ADC &7B:STA &7
1:JMP beg
 9250 .read LDA (&70),Y:STA
(&72),Y:JMP ret
 9260 .write LDA (&72),Y:STA
(&70),Y:JMP ret
 9270 .er RTS
 9280 ]
 9290 NEXT
 9300 ENDPROC
 9310
 9320 DEF FNaddress(x,y)
 9330 =&5800+(x*8)+(y*320)
 9350 DEF PROCwindow(x1,y1,x
4,y4,safe,space,do)
 9360 LOCAL a1,a2,a4,a5,j
 9370 x4=x4+1
 9380 a1=FNaddress(x1,y1):a2
=FNaddress(x4,y1):a4=FNaddre
ss(x4,y4):a5=FNaddress(x1,y1
+1)
 9390 !&72=safe:!&74=a1:!&76
=a4
 9400 j=a2-a1:!&78=j
 9410 j=a5-a2:!&7A=j
 9420 j=j*(y4-y1):left=space
-j
 9430 IF j>space:ok%=FALSE:E
NDPROC
 9440 j=y4-y1:?&7F=j:?&80=0:
?&7E=do
 9450 CALL &900
 9460 ENDPROC
 9470
 9480 DEF FNmenu(X%,Y%,n%,t$
)
 9490 LOCAL max%,x1,y1,x2,y2
,o%,O%
 9500 VDU23,1,0;0;0;0;
 9510 FOR L=1 TO n%
 9520 IF LEN(menu$(L))>max%
max%=LEN(menu$(L))
 9530 NEXT
 9540 IF LEN(t$)>max% max%=L
EN(t$)
 9550 x1=X%:x2=x1+max%+1:y1=
Y%:y2=y1+n%+2
 9560 IF x2>39 THEN =-1 ELSE
 IF y2>32 THEN =-2
 9570 ok%=TRUE:PROCwindow(x1
,y1,x2,y2,safe,5000,2)
 9580 IF ok%=FALSE THEN =-3
 9590 COLOUR 128:COLOUR 1
 9600 FOR L=1 TO n%
 9610 PRINT TAB(x1,L+y1);CHR
$225;menu$(L);SPC(max%-LEN(m
enu$(L)));CHR$225;
 9620 NEXT
 9630 PRINT TAB(x1,y2-1);CHR
$228;STRING$(max%,CHR$224);C
HR$229;TAB(x1,y1);CHR$226;ST
RING$(max%,CHR$224);CHR$227
 9640 t%=LEN(t$)/2:m%=max%/2
:PRINTTAB(x1+(m%-t%)+1,y1);t
$;
 9650 O%=1:PROCblock(0,129,0
%):*FX4,1
 9660 REPEAT
 9670 o%=O%:*FX19
 9680 IF INKEY-42 OR INKEY-1
05 O%=O%+1
 9690 IF INKEY-58 OR INKEY-7
3 O%=O%-1
 9700 IF O%<1 O%=n% ELSE IF
O%>n% O%=1
 9710 IF o%<>O% PROCblock(1,
128,o%):PROCblock(0,129,O%)
 9720 UNTIL INKEY-74
 9730 PROCwindow(x1,y1,x2,y2
,safe,5000,1)
 9740 =O%
 9750
 9760 DEF PROCblock(c1%,c2%,
O%)
 9770 COLOUR c1%:COLOUR c2%
 9780 PRINT TAB(x1+1,y1+O%);
menu$(O%);
 9790 COLOUR 1:COLOUR 128
 9800 ENDPROC
```

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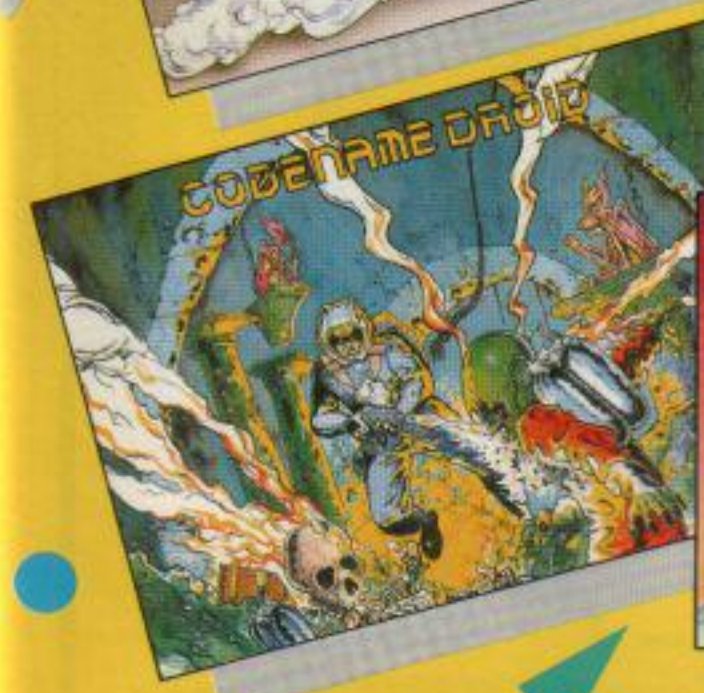

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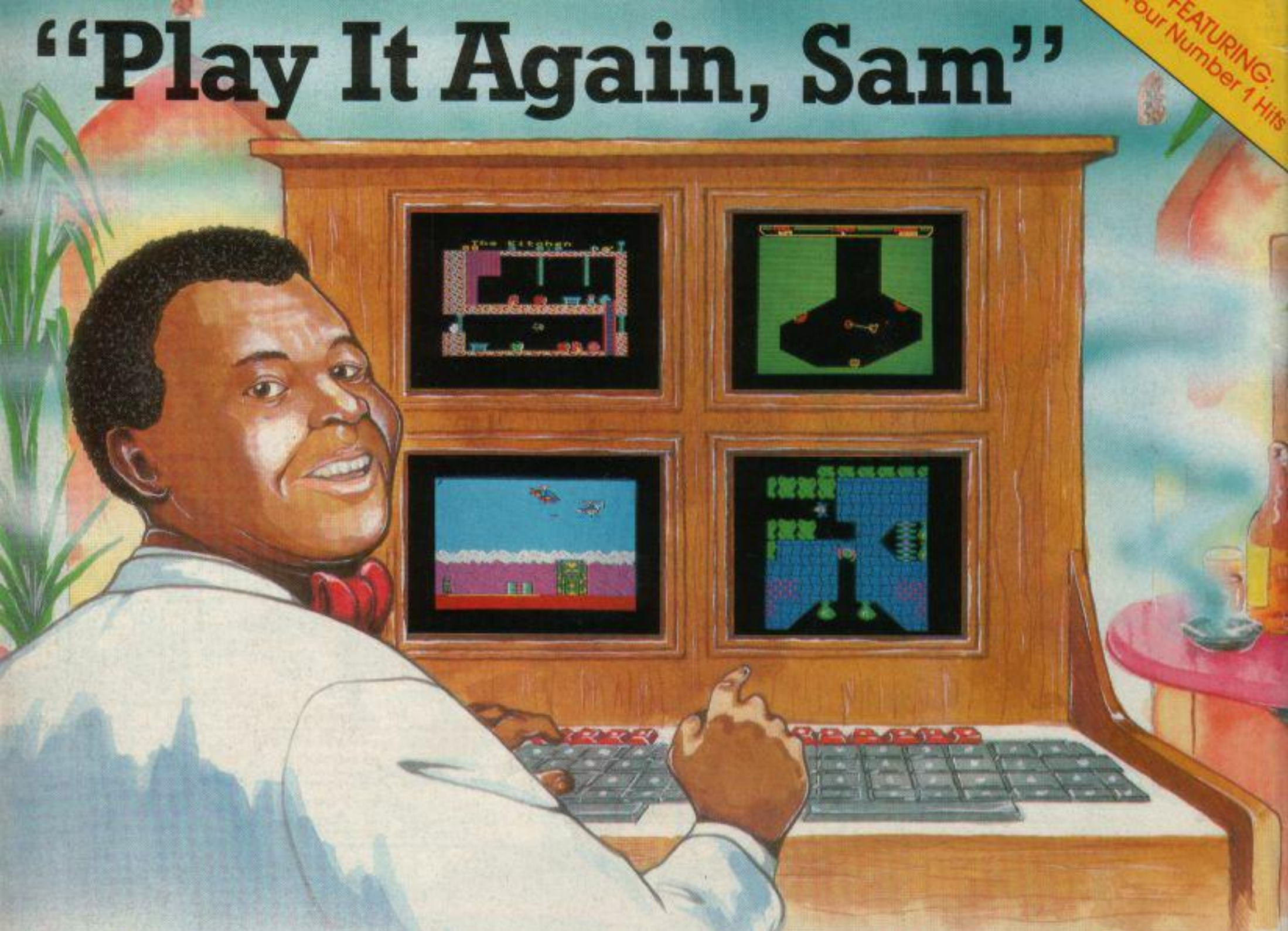

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